Chapter 1

Āyurvedic Knowledge of Anatomy: To Understand Body and Disease

Introduction

I Anatomical Knowledge in Āyurveda

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Introduction

Men need a theory, for the phenomena that come under observation are so numerous that in default of a theory they would elude our grasp. Medicine must be guided by a theory, for otherwise medical doctrine could not be handed on from teacher to pupil. After these observations Henry Sigerist, the doyen of history of medicine, remarked, "Every theory is philosophical in its nature. It works with the thoughts, with the concepts, available at any particular epoch, thus moulding the culture of the time." (Sigerist, 1958: 15) Cunningham lets us know that the cumulative effect of different 'kinds' of anatomy in Europe led to fostering of "a general belief that detailed anatomical knowledge was the *sine qua non* of a complete medical education, for physicians as well as surgeons." (Cunningham, 1975: 14) In European context, Cunningham traces the 'kinds' of anatomy from 'popular' and 'demonstrative' to 'philosophical' anatomy to modern anatomy. So long as theory and practice, science and practice harmonise, so long as theory derives from practice and, in its turn, guides practice, medical science and practice will be fruitful, as noted by Sigerist. (Sigerist, 1958: 15) Theorization of anatomical knowledge too, following this, depends on available means of a particular period. John Abernethy, a very influential figure of the eighteenth-nineteenth century anatomy and surgery in British medicine, wrote, "There was a time when medical men entertained so determined a dislike to the word *theory* that they could scarcely tolerate the term... When also in the prosecution of our anatomical enquiries, we as it were analyze the body, or reduce it to its elementary parts... we become lost in astonishment that such important ends can be effected by apparently such simple means." (Abernethy, 1814: 9, 15) Theorization was a contested area in French medicine too. Even a person like Rene Laennec (the great inventor of stethoscope in 1816) regarded theories as only aids to

memory. In his course of 1822, he even went so far as to say that only facts constituted science. (Ackerknecht, 1967: 7-33)

Following Alexander's invasion of India the great Roman geographer, philosopher and historian Strabo writes, "There is a class of physicians, according to Megasthenes, among the Germanes (Shramans) who rely most on diet and regimen, and next on external applications, having a great distrust of the effects of more powerful modes of treatment. They are also said to at that early period to have employed charms in aid of their medicines." (Wise, 1860: xiii) He was most likely talking of Āyurvedic practitioners (both Brahmans and Shramans) of that period who believed more on the balance of diet, physical system, and ethico-moral component of a person than on his bodily structure, pathological and anatomical details and organ specific treatment of disease. Medicine can be regarded as the most important of all physical sciences which were cultivated in India. "It was directly and intimately connected with the Sāṃkhya and Vaiśeṣika physics and was probably the *origin* of the logical speculations subsequently." (Dasgupta, 1991) It is also noted, "From the view of history of philosophy the Saṃkhya of Caraka and Pañcaśikha is very important; for it shows a transitional stage of thought between the Upaniṣad ideas and the orthodox Saṃkhya doctrine as represented by Īśvarakṛṣṇa." (Dasgupta, 1991: 219) It becomes evident that the study of medicine was, in another sense, the study of philosophy and *theory of human origin* too. The basic difference between the two is probably centered on application – if in the field of health or not. Indian medicine had in Pāṇini's time already attained a certain degree of cultivation. It appears from the names of various diseases specified by him (iii.3.108, v.2.129 &c), though nothing definite results from this. (Weber, 1892: 266)

It is understood that the study of anatomy was of much importance in ancient Indian medical tradition. Though, to remember, in a diachronic perspective, however, one may safely assume that quite a number of different body concepts were current at the time of the CS's (*Carakasaṃhitā*) composition. (Maas, 2008: 140) In *Carakasaṃhitā* –

Śārīraṃ sarvathā sarvai sarvadā veda yo bhiṣak /

Āyurvedaṃ sa katsarnyena veda lokasukhapradam // (Śārīrasthānam, 6.19) [The physician who is always conversant with the various aspects of the entire body, is the very person who is proficient in the āyurveda which can bring about happiness to the

humankind.] It also teaches us, "Detailed knowledge of the human body is conducive to the well-being of the individual...It is because of this that experts extol the knowledge of the details of the body." (*Carakasamhitā* , Sharma and Dash, 1977, Vol. II: 426) In *Suśrutasaṃhitā* (all the verses have been cited from Trikamji Āchārya's edition. (Achārya, 2008)) –

Pratyakṣato hi yadṛṣṭam śāstradṛṣṭaṇca yadbhavet /

Samāsatastadubhayaṃ bhūyo jnānavivardhnam // [The practical knowledge along with theoretical knowledge is very essential. Whatever is seen while doing practical study and going through Śāstra, adds the knowledge, when both are applied together.] (Śā. 5.48) Again – "The different parts or members of the body as mentioned before including even the skin cannot be correctly described by any one who is not versed in Anatomy...For a thorough knowledge can only be acquired by comparing the accounts given in the Sāstras (books on the subject) by direct personal observation." (Śārīrasthānam, 5.49) (Bishagratna, 1963, Vol. II: 171-172) The place of Śāstra is too important where *text* becomes *authority*. For example, in *CS – nānāryamāśrayet* [Do not take recourse to *anārya*-s (non-Aryans). Su, 8.19]

In *SS*, "The primary position of surgery" is described in this way – "Hear me discourse on the Science of Surgery (Shalya-Tantram) which is the oldest of all the other branches of the Science of Medicine (Āyurveda) and is further corroborated by the four classes of testimonies, viz., Perception, Inference, Analogy and Scriptural Truths (Āgamas). The primary position of this branch of the Āyurveda, (as regards its. time or origin), may be inferred from the fact that Surgery lends her aid materially towards the healing up of traumatic ulcers. The second reason for such an inference may be deduced from the replacement of the severed head of Yajna." (Bhishagratna, 1963, Vol. I: 6-7) To add, "All hold this Tantram to be the most important of all the other branches of medicine... inasmuch as it contains all that can be found in the other branches of the science of medicine as well, with the superior advantage of producing instantaneous effects by means of surgical instruments and appliances. Hence it is the highest in value of all the medical Tantras." (Bhishagratna, Vol. I: 7-8) Hence surgical texts and applications gain an important place following this logic. Moreover acquisition of practical skills and knowledge becomes points of merit for a physician. "A physician,

well versed in the principles of the science of medicine (Āyurveda), but unskillful in his art through want of practice, loses his wit at the bedside of his patient, just as, a coward is at his wit's end to determine what to do when for the first time he finds himself in the ranks of a contending army." (Bhishagratna, Vol. I: 30) Here comparison of an unskillful physician with an army man is interesting to note. Does it indicate anything to have any relationship of ancient Indian surgery with war?

Meulenbeld succinctly summarizes "The Many Faces of Āyurveda." (Meulenbeld, 1995) In his analysis, he views Āyurveda as a gradually evolved Indian medical system. It remains intimately connected with Indian culture as a whole. Of particular importance is the relation of medicine and philosophy in Āyurveda. In his observation, "The *Carakasaṃhitā* and *Suśrutasaṃhitā* contain numerous passages that seem to indicate that philosophical concepts did not fit in well with medical doctrines." (Meulenbeld, 1995: 2) He further adds, "Later, in the age of great commentators... Author, in particular some of them, like Cakrapāṇidatta for example, devoted much energy to the interpretation of the classical texts in agreement with philosophical doctrines that had become authoritative." (Meulenbeld, 1995: 2) He discusses about relationship of medicine, philosophy and religion in Āyurveda and makes brief, yet comprehensive, comparison with the formative period of Greek medicine. To emphasize at this point, this dissertation is not primarily concerned with the philosophical issues in Āyurveda until and unless it is strongly demanded by the course of argument.

Following Meulenbeld's argument we can extrapolate the phases of changes and developments in Āyurveda. (1) Vāgbhaṭa I's (probably 600 A.D.) *Aṣṭāṅgahṛdayasaṃhitā* "heralds a new era of by introducing a consistent system of medicine" and production of texts in elegant Sanskrit verse. (2) systematic and eclectic attempt in Mādhava's system of pathology *Mādhavanidāna* to classify diseases nosologically, (3) sudden appearance of a new branch *Nāḍiśāstra* in Āyurveda in the thirteenth and fourteenth centuries, (4) the inspection of urine *Mūtraparikṣā* becoming more widespread, (5) from 1500 A.D. onwards *Aṣṭasthānaparikṣā* – the eightfold examination – consisting of the examination of pulse, urine, faeces, tongue, voice, skin, eyes, and face or general appearance gradually becoming the norm, (6) the blending of medicine and alchemy becoming conspicuous feature since the times of Cakrapāṇidatta (11th century A.D.) and Vaṅgasena (11th or 12th

century A.D.), and, finally, (7) "the decline of surgery, and, closely bound up with it, of *anatomical knowledge*." (Meulenbeld, 1995: 7) Besides these, there are noticeable influences of Islamic medicine (c.f. a special medicinal preparation *arka*, of Arabic origin from about A.D. 1200) and Western medicine on the system of nosology "The nineteenth century is the age of the revival of Āyurveda and its professionalization." (Meulenbeld, 1995: 10)

Ancient Indian physicians used only drugs, mostly vegetable products, but from around the seventh century metals were used too, especially mercury but also compounds of iron and other minerals. By the thirteenth century the pulse was being examined, and in the sixteenth century an important Āyurvedic healer in Varanasi, Bhavamiśra, identified the new form of syphilis which had been introduced by the Portuguese. Significantly, he called it "the Frank [European] disease," and said it was usually caused by intercourse with Frank women. (Pearson, 1995: 149) Another important point to note here is that the culture of Islam had a definite influence on Āyurveda. The Muslims brought with them their own system of medicine derived from the Greeks. Both systems interacted and borrowed from each other. But despite this fact "Remarkable is the absence of changes in the theory. The borrowings that can be detected are restricted to the practice of medicine." (Meulenbeld, 1995: 8) This is also seen during the 'revivalist' period of Āyurveda. "An ambiguous situation is reflected in the literature of that period. On the one hand one observes a renewed interest in the classical *saṃhitās*, which were repeatedly printed, while, on the other, there was *no break* with the preceding period to be seen in the works compiled or composed in the nineteenth century." (Meulenbeld, 1995: 9)

As discussed earlier, "The large saṃhitas are didactic texts in prose and verse of varied metres. The prose passages generally contain mnemonic verses which summarise them." (Filliozat, 1964: 25) The chapters entirely in verse are specially those that contain the enumeration of symptoms or therapeutic prescriptions. They are, therefore, the ones which it is most useful to know by heart for practicing, whereas the passages in prose generally deal with the theoretical principles. "The choice of prose or verse seems, therefore, to have been dictated chiefly by a pedagogic desire." (Filliozat, 1964: 26) In his 'Foreword' to *Agniveśa's Caraka Saṃhitā* Shiv Sharma possibly warns of this trend,

"Here and there, the author brings a touch of modernity to the ancient text. He describes assembly of Ṛṣis in the Caitraratha forest as a "symposium", and the Ṛṣis themselves as "participants in the symposium..." As a result he has almost bodily lifted the assembly from the beautiful Caitraratha forest and deposited it in a committee room of a modern institution."(Sharma and Dash, 1977, Vol. I) Translators themselves too admits this fact, "There are innumerable difficulties in translating a text into another language, especially so in translating an *Āyurvedic* text." (Sharma and Dash, 1977, Vol. I: xliii) In *CS* it is explicitly stated, "If something, already classified in a particular manner, is reclassified in another way following different criteria, there may be a change in the number of groups, and such a change (as suggested in the previous paragraph) should not render the statement suggesting such a classification incorrect." (Sharma and Dash, 1977, Vol. I: 184) Further, "An individual has the liberty to classify things as he likes...This does not invalidate the number of groups according to some other mode of classification...Thus the term *roga* is synonymous with both the *doṣa* and *vyādhi* (disease)...For the rest like *hetu* (etiology) etc., this term, viz. *roga* carries a different meaning." (Sharma and Dash, 1977, Vol. I: 185) [This particular has been discussed in the previous chapter.] One of such difficult terms (and ideas associated with it) is *doṣa*. Scholars, excepting a few, have consistently translated it as humor (as perceived in Greek medicine, principally by Hippocrates). However, there is a fundamental difference between humor and *doṣa*. In Hippocrates humor stands for juices, "And it appears to me that one ought also to know what diseases arise in man from the powers, and what from the structures. What do I mean by this? By powers, I mean intense and strong juices; and by structures, whatever conformations there are in man." (Adams, 1819, Vol. II: 176) To one scholar, "at Greek medicine, where the four humors (the word used is 'juices' – blood, phlegm, yellow bile, and black bile – play a central role in the texts of Hippocratic corpus (perhaps rather in the younger texts of the corpus)." (Scharfe, 1999: 612) In another authentic translation Hippocrates, "The health of the body depends upon the combination of its various juices." (Jones, 1931, Vol. I: 346) Even scholars like Dominik Wujastyk, Kenneth G. Zysk and Francis Zimmermann often subscribe to this received wisdom. Meulenbeld has kept the term *doṣa* intact in its usage, Filliozat terms it as 'trouble', Scharfe as 'faults', while Rahul P Das has translated *doṣa* as 'morbific entity.' In this dissertation, *doṣa* will

be used as such. What is *doṣa*? Meulenbeld addresses the problem, "The classical treatises on āyurveda are in large measure determined by the doctrine of the *doṣas*, but nevertheless they do not specify which characteristics determine that particular constituent of the body belongs to that group." (Meulenbeld, 1992: 1) Pitman in her comparative study on the conception of wholeness between Greek and Indian medicine notes that 'humor' evidently means any fluid discharge in Greek concept. (Pitman, 2006: 105)

Having addressed the issue of *doṣa* and its comparison with Greek humors we can now proceed to a large number of anatomical as well as physiological terminological problems related to explanations of body mechanisms as faced in Āyurvedic texts. Some of these most used terms are *śirā*, *dhamanī*, *snāyu*, *ojas* and *srotas*. (Wujastyk, 1998: 36-37) As seen in the previous chapter, in ancient India "Anatomical observations, again, were certain to be brought about by the dissection of the victim at the sacrifice, and the dedication of its different parts to different deities... Animal anatomy was evidently thoroughly understood, as each separate part had its own distinctive name." (Weber, 1892: 30) The chapter of the *Amarkośa* (ii.6) on the human body and its diseases certainly presupposes an advanced cultivation of science. (Weber, 1892: 267) Kunjlal Bhishagratna's translation of *SS* exposes the character of fleeting meanings of the term *śirā*. In the section *Śirā-varṇanā-Vibhaktināma Śārīram*, it is translated as 'vessels.' (Bhishagratna, Vol. II: 191) But, while describing 'Principal Śīrās', 'Vāyu-carrying Śīrās' are translated as 'nerves', 'Pitta-carrying Śīrās' as 'veins', and for Kapha it stands as 'lymphatic vessels.' (Bhishagratna, Vol. II: 192) In chapter ix of Śārīrasthānam (*Dhamanī-Vyākarana- Śārīram*) Dhamanīs are termed as 'ducts.' (Bhishagratna, Vol. II: 209) Dhamanī is derived from the root *dham*, to blow. In his footnote, Bhisagratna explains it as "to be filled with air." Why so? He gives his explanatory note – "so called from the fact of their being distended with air after death." (Bhishagratna, Vol. II: 209) [It is curious to note that modern explanation of post-mortem changes were unscrupulously used to explain phenomena of ancient texts. Such explanations, it can be presumed, was altogether unknown to the authors of Āyurvedic texts.] In the same chapter, Dhamanīs were translated as 'arteries' and even 'nerves.' What can be extrapolated from all these and following discussion is that it is the visual representation of that world of discourse

where no concrete human body is taken into account. Text serves as authority in this discourse. We can give an example from an important recent paper by Wujastyk.

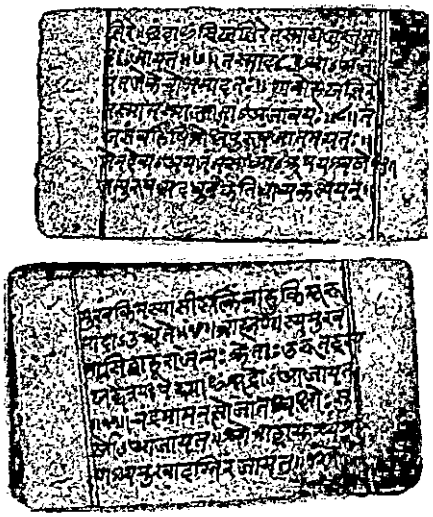

Fig. 6

[The body in text alone: Sanskrit manuscript folio of the *Puruṣasūkta* from the *Ṛgveda* (hymn 10.90), showing verse 11, *yat puruṣaṃ vyadádhuḥ...*, on the sacrificial division. Wellcome MS Indic δ1951. Wellcome Library, London.] (Wujastyk, 2009: 191)

I. Anatomical Knowledge in Āyurveda

In an important scholarly work this problem is taken up in a different way. "**Dhamanī,** 'reed,' appears to denote 'pipe' in a passage of the Rigveda and in a citation appearing in the Nirukta. In the Atharvaveda it denotes, perhaps, 'artery' or 'vein,' or more generally 'intestinal channel,' being coupled in some passages with Hira." (Macdonell and Keith, 1912, Vol. I: 390) Similar connotations are found in *SS* too – "As the stem and leaves etc, of a lotus plant, originated from its bulb, spread over the whole surface of a pool or tank (lit: water), so the vessels emanating from the umbilicus of a man spread over his whole organism." (Bhishagratna, Vol. II: 197) Two points may be noted here – first, just after describing the anatomical ways of making surgical incisions in strict considerations of *marmas*, to be correct *marmans*, (like 'Utkshepa-Marmas', 'Simanta-Marmas' and 'Adhipati-Marma') vessels are compared with a natural creation flower, and, second, vessels are supposed to come out from 'the umbilicus of man'. Both of these have little standing with anatomy if it is understood to be a discipline to primarily understand organ localization. Wujastyk finds that the variety of ancient Indian

body concepts is naturally reflected in a rich Sanskrit vocabulary of names for the body, a litany of which includes such terms as *sarīram, kāyaḥ, dehaḥ, vigrahaḥ, aṅgam, vapus, kalevaram, tanus, gātram, savaḥ* and *kuṇapaḥ*, each carrying its own particular connotations according to usage and etymology. India, then, produced a rich and diverse world of body-discourse all of her own. (Wujastyk, 2009)

Regarding *marman* (vital/lethal spots), as described in Indian medical and non-medical texts, Filliozat notes, "Medicine has not created this element of its anatomical representation; it has received the same from the Vedic tradition in a ready-made form and has only developed it." (Filliozat, 1964: 164) In this connection, Hoernle finds that Vāgbhaṭa, while discussing *marman*, counts "only two ankle-bones and two wrist-bones." (Hoernle, 1994: 95) Otherwise, these figures are eight and four respectively. Elucidation of *marman* in this case results in variation in the number of bodily parts. Another point should be mentioned here. In the *Garbha Upaniṣad*, the vital spots or *marman*-s are counted to be 107 in number. (Dasgupta, 1991: 312-313) It will become evident later that anatomical terms and organs were directly incorporated into Āyurveda largely from non-medical texts. Furthermore, "there are also *marman*-s which are not listed in the usual *marman*-lists..." (Das, 2003: 568) Again, some of the texts like Kāśyapasaṃhitā also regard head heart and bladder as the three principal vital points. (Meulenbeld, 2008a: 488)

Similar confusion arises while explaining the concept of *ojas* in Āyurveda. In *CS* it is described thus – The pure slightly yellowish blood which dwells in the heart is called *ojas*. If it is destroyed, the body perishes. (Sharma and Das, Vol. I: 74) Again, it is said – *ojas* – carrying dhamanīs are extended in all spaces of all animals. It is the *ojas* which keeps all living beings refreshes. There can be no life without *ojas*... But all these action of *ojas* manifest itself in different ways, only with the help of these vessels. (Sharma and Das, Sū. 30.8-9) In Cakrapāṇidatta's redaction, "Actually the body of the foetus does not serve as food for evil spirits who move in nights and live on *ojas*." (Sharma and Das, Sā. 2.10) However, Dash and Sharma explain, "*ojas* is of two types – one is of eight drops in quantity and the other is half *añjali* (48 ml.)." (Sharma and Das, Vol. II: 353) In Suśruta's explanation, "*ojaḥ somātmakam snigdham śuklam śītam sthiram rasam : viviktam mṛdu mṛtsnaṁ ca prāṇāyātanamuttamam.*" (Filliozat, 1964: 167) Filliozat

explains, "*ojas* is of nature of Soma, unctuous, white, fresh, substantial, fluid, pure and sweet; it is the principle seat of life." He also notes, "It can be seen that it is not only because of the name that the *ojas* of the medical texts is identified with that whose possession was attributed by the Veda to the warrior Indra." There were also attempts to identify the *ojas* with albumin of modern medicine. However, in *CS* (Sū. 17, 74-75): "That pure (substance) which stays in the heart and is (of a) slightly red (colour), tinged with yellow, is called the vital fluid of the body; by its annihilation a man is annihilated. The vital fluid arises first in the body of bodily beings; it arises with the colour of ghee, the taste of honey and the smell of parched grain." (Meulenbeld, 2008a: 451)

We are again confounded by a problem – what is the character of *ojas*? Is it humoral concept or a physical quantity? It becomes one of the standing puzzles of Indian medicine. Moreover, it may be worthwhile to note that Indian medicine, like other ancient medicines, sees 'flesh' instead of 'muscle' in modern medical sense. It should be added here that it was all 'flesh', not 'muscle', which has been discussed all through ancient Indian texts. Similar problem was found in Greek medicine too. "Plato did not distinguish muscles from flesh, either in terms of structure or function. Nor did he consider that the flesh was in any way involved in movement." (Shanks, 2000: 67; Matuk, 2006) To conceptualize the difference between 'muscle' and 'flesh' is a kind of cognitive leap forward in the history of medicine. Similar problem was noted by Kuriyama too, though, in the context of Japan. In Japan's experience Kuriyama observes, that the essence of changing one's outlook was learning to conceive of the body anatomically. (Kuriyama, 1993) He further stresses, "That perception and attention are intimately related is both a commonplace of academic psychology and a fact of daily experience." (Kuriyama, 1993: 40) Next problematic term to face in reading the Āyurvedic categories is *srota*. It is said – *jāvantaḥ puruṣe mūrtimanto bhāvaviśeṣāstāvanto evāsmin srotasāṃ prakaraviśeṣāḥ* [there are same number of *srotas* in a human body as are the number of the structural entities like *rasa*, *rakta* (blood) etc.] (Sharma and Dash, Vi, 5.3)[1] It is also said, "*srotas* (channels), *sirā* (vein), *dhamani* (artery), *rasāyanī* (lymphatic channel), *rasavāhinī* (capillary), *nāḍī* (duct), *panthā* (passage), *mārga* (track), *śarīrachhidra* (spaces inside the body), *saṃvṛtāsaṃvṛta* (duct

[1] Vi stands for Vimānasthāna.

closed at one end and open at the other), *sthāna* (residence), *āśaya* (container) and *niketa* (abode) – these are the names attributed to various visible and invisible spaces inside the tissue elements of the body." (Sharma and Dash, Vol. II: 177) Dasgupta notes, "It seems to have been recognized that there was a general flow the liquid elements in the body. This probably corresponds to the notion of *srotas*." (Dasgupta, 1991: 291) Interestingly, "Suśruta refers to the Caraka's view that *śirās*, *srotas* and *dhamanis* are the same and opposes it, saying that they are different in appearance, number and functions." (Dasgupta, 1991: 349) We should take care of the terms like appearance, number and function. Appearance can be gauged by anyone, without being an anatomist, seeing the channels in the body. Number happens to be almost always arbitrary in Āyurvedic texts. Regarding function, it is explained in terms of *tri-doṣa* theory. What is not mentioned is the structure of *srotas*. Exact structure of *srotas*, if it could have been determined, would certainly point to anatomical practices in ancient India. *Snāyu* is another problematic term. The general tendency of the Sanskrit scholars is to regard *snāyu* as nerve. But this is contradicted by its etymological derivation from '*snā*' or '*si*' to bind and the Suśruta mentions 210 joints, but does not say anything anywhere else of the binding material that holds them together excepting of 14 '*sīmanta*' at the junction of more than two bones (*saṃghāta*). Furthermore, "it is possible that by '*snāyu*' Charaka and Suśruta meant something entirely different from the ligament and the tendon." (Chakraberty, 1923: 33) An important observation, though arising from a different context, can be cited here. Hopefully, this will help us understand the problem form a different perspective of Western origin but related to same sort of difficulties of connotations of anatomical terms.

Charles Singer notes, "Naked-eye human anatomy employs some five thousand technical terms...For the major parts of the body, and especially the external parts, we use mostly the ordinary colloquial English, terms, Most of these are traceable to Teutonic, and all of them to Indo-European roots; such are leg, thigh, shoulder, belly, breast, heart, lung, liver, bladder. These also are butchers' terms." (Singer, 1957: 1) How this problem was solved? Singer explains, "The Greeks had no classical language from which to draw technical terms. They therefore often made a term technical by giving a colloquial expression a strained sense, thus drawing attention to its special use. Thus, for

example, *pankreas* means simply 'all flesh', a term which might be applied to many other organs." (Singer, 1957: 5) He also reminds us, "It is sometimes forgotten that Greek science endured for longer than has modern science." (Ibid, 5) The same holds good for Āyurveda too. Having kept these problems and particularities in mind next step towards understanding of the human body in Āyurvedic texts can be made. Another observation may be mentioned here, "As Hindu medicine has seldom been able to shake itself completely free from the influence of magic and alchemy as auxiliaries, physicians, as practicers of the "black art," have been given an inferior position in the legal treatises." (Ray, 1903: viii) There was also an assumed underlying division between the 'Dhanvantari sect' (used to practice surgery) and 'Veda-vadī sect' even down to the twentieth century. While the former sect relied more on *āgama* (Vedic principles) as the primary source of reasoning and knowledge, the latter took recourse to *pratyakṣa* (direct apprehension) as their premise of knowledge. (Bhattacharya, 2001)

Āyurvedic terms from non-Āyurvedic sources

"The interest of the Vedic Indians seems early to have been attracted to the consideration of questions connected with the *anatomy* of the body." (Mcdonell and Keith, 1912, Vol. II: 358) A hymn of Atharva Veda enumerates many parts of the body with some approach to accuracy and orderly arrangement. (Bloomfield, 1897) "There are twelve months in the year, and these twelve breathings in man, and these (two) now are one and the same; - there are thirteen months in the (leap-) year, and these thirteen (channels of) breathings in man, the navel being the thirteenth, and these (two) now are one and the same;" (Bloomfield, 1897: 168). Also, "And there are three hundred and sixty nights in the year, and three hundred and sixty bones in man, and these (two) now are one and the same;--there are three hundred and sixty days in the year, and three hundred and sixty parts of marrow in man, and these (two) now are one and the same." (Ibid, 169) Now there must come up questions regarding origin anatomical knowledge in ancient India. It will be found in further discussions that the conception of the human body (or body image) is derived in a huge amount from non-Āyurvedic texts. This knowledge was codified, given some technical applicability to an extent and made to use for healing purposes in Āyurveda. It may now be profitable to search for non- Āyurvedic

texts from which various notions and bony structures and different organs were derived. "We should, therefore, look for the birth of a scientific Āyurveda in the texts which have preceded it." (Filliozat, 31) The reading and explanations of Āyurveda by Filliozat, Meulenbeld, Wujastyk, Zysk, Das, P. V. Sharma and Zimmermann are particularly helpful in understanding specific problems of anatomical knowledge in Āyurveda. He reminds that the number of anatomical terms found in the Vedic Samhitās is quite large. A large number of different parts of the body have each a special name and sometimes several names. Many of these names have passed from Vedic Sanskrit into classical Sanskrit and are consequently met with both in medical texts and in Vedic hymns, because they do not have a strictly technical value and their knowledge has never been limited to savants. Unfortunately, there are no precise anatomical descriptions in the medical books, lesser still the figures. In India, where oral instruction surpasses other forms, anatomy, which can be really learnt best only by direct examination, was certainly taught orally. The books contained only lists to help the memory. We cannot, therefore, always identify an organ, whose name is nevertheless employed both in the Vedic and Ayurvedic texts. Moreover, a certain number of names are found only in the Veda.

Against this perspective some of the most important texts directly contributing to the knowledge of anatomy in Āyurveda can be located. These are *Atharva Veda*, *Śatapatha Brāhmana*, *Śāṅkhāyana Āraṇyaka*, *Maitrāyaṇi Saṃhita*, *Taittiriya Upaniṣad*, *Aitareya Brāhmana*, *Aitareya Āraṇyaka*, *Vishnu Smriti*, *Jājñavalkya Smṛiti*, *Hārīta Saṃhitā* etc. In the above-mentioned *Garbha Upaniṣad*, there is a description of fetal development. In that connection it is told that a body is called *śarīra*, because three fires reside in it (*śrayante*), viz. the *koṣṭhāgni*, *darśanagni* and *jñānāgni*. (Dasgupta, 1991: 313) *Garuḍa Puraṇa* contains treatises on various subjects like astrology, palmistry and precious stones and "one still more extensive on medicine." (Reed, 1891: 374) Some of these texts give a detailed account of bones of a human body, some others provide account of sacrificial rituals and the way bones are collected after cremation. Now the obvious question arises – how bones would be collected if touching a dead body was a social taboo? Some explanatory notes based on texts and extrapolating from them may be forwarded. There is mention of an instrument *pavana* in the Atharvaveda which actually

denotes an instrument for purifying grain from husks, etc. (Mcdonell and Keith, Vol. I: 507)

In *Hārīta Saṃhitā* is told "The rite of depositing bones [should be performed] within the three days after death..." (Dutt, 1906: 217) Similar ritual practice is found in *Vishnu Smriti* too, "On the fourth day they must collect the bones that have been left." (Jolly, 1880: 76) Further, to mention here, is that there were practices of collecting bones of the dead person. This collection of bones must have exposed the Ayurvedic physicians to surface morphology and structure of bones. There is mention of dissection of the sacrificial animals (*paśor vibhakti*). Sṛñjayas and the Kurus are said to have taught Girija Bābhravya the science of this dissection. (Mcdonell and Keith, Vol. I: 376) In *Vishnu Smriti* (*The Institutes of Vishnu*) we find, "43. He must recognize this human frame to consist of seven elements. 44. Those elements are adeps, blood, flesh, serum of flesh, bone, marrow, and semen." (Jolly, 1880: 283) Again, the number of bones is like this "58. There are twenty nails. 59. There are as many bones to the hands and feet (one at the root of each finger and toe). 60. There are sixty joints to the fingers and toes. 61. There are two (bones) to the two heels. 62. There are four to the ankles. 63. There are four to the elbows. 64. There are two to the shanks. 65. There are two to the knees and two to the cheeks. 66. (There are two) to the thighs and (two) to the shoulders. 67. (There are two) to the lower part of the temples, (two) to the palate, and (two) to the hips. 68. There is one bone to the organs of generation. 69. The backbone consists of forty-five (bones). 70. The neck consists of fifteen (bones). 71. The collar-bone consists of one (bone on each side)." (Ibid, 284) Examples can be multiplied. But this brief account makes one understand how the descriptions of bones and other structures of the human body were incorporated into the medical texts. Another relevant issue arises with the question of burial or cremation. According to the customs prescribed by the Sūtras, the bones should be collected after cremation. (Muir, 1868, Vol. V: 316) In *Vedic Index* it is explained, "**Agni-dagdha.** This epithet ('burnt with fire') applies to the dead who were burned on the funeral pyre. This is one of the two normal methods of disposing of the dead, the other being burial (*an-agnidagdhāḥ*, 'not burnt with fire'). The Atharvaveda adds two further modes of disposal to that viz., casting out (*paroptāḥ*), and the exposure of the dead (*uddhitāḥ*)...Burial was clearly not rare in the Rig Vedic period: a whole hymn

describes the ritual attending it." (Vol. I: 8) Another observation may be added here. The well-known distinction drawn in the Rig Veda (x. 15, 14) between *agnidagdha*-s and *anagnidagdha*-s, shows those other forms were known and practiced. "It is not at all impossible that Rig Veda (x. 18.10) originally referred to the rite of burial (Winternitz, Ges. d. ind. Lit. I. 85). The data as to burial are found in the Vedic hymns and especially in the Sutras the Grihya and the Petrimedha and kindred texts and in the records of modern usages. But cremation of the dead was and still is the ordinary practice." (Banerjee, 1920: 200) Some verses of *Atharva-Veda Saṃhitā* accompany the deposit of the collected bone-relics "at the root of a tree." (Whitney, 1905, Vol. II: 838) Another verse is used in connection with gathering up the bones after cremation. (Ibid, 837) There are several enumerations of the parts of the body, not merely of the skeleton, in the Yajurveda Saṃhitās. They include the hair (*lomāni*), skin (*tvac*), flesh (*māṃsa*), bone (*asthi*), marrow (*majjan*), liver (*yakṛt*), lungs (*kloman*), kidneys (*matasne*), gall (*pitta*), entrails (*āntrāṇi*), bowels (*gudaḥ*), spleen (*plīhan*), navel (*nābhi*), etc. (Mcdonell and Keith, 1912, Vol. II: 361) In this connection more may be had from the *Vedic Studies*. The author notes that the fortress of the gods is, as Sāyaṇa explains, the human body; the nine doors are the nine apertures of the body, namely, the two ears, the two eyes, the two nostrils (or according to others, the nose and the *brahma-randhra*), the mouth, the *upastha* and *pāyu*: and the eight wheels are the eight *dhatavah* or elements' of the body *tvac* (skin), *asṛj* (blood), *medas* (fat), *asthin* (bone), *majjan* (marrow), *śukra* (semen), *māṃsa* (flesh), and *ojas*. The sheath of gold within it is the heart, which is the abode of the *atman*. (Venkatasubbaiah, 1932: 169) In this description heart is compared to a "lotus-bud, facing downwards...one span below the neck (that is, below the top of the windpipe), and above the navel." In *Śatapatha Brahmaṇa*, to note, the heart is described as smooth, circular in shape and nearer to the right armpit. (Saha, 1999: 11) The mention of '*pṛṣṭi*' and '*kīkasā*' has also been found in *Śatapatha*. As per commentary of Sāyaṇa *pṛṣṭi* is the normal side-bones of the waist and *kīkasā* is the short side-bones. (Ibid. 13) Filliozat, having taken all these facts into consideration, makes his insightful comment, "The constituents of the body recognised by the Veda are those which Āyurveda has also recognised. The majority comes within the same sense and the notions concerning them are, properly speaking, not anatomical but commonplace." (Filliozat, 164) However,

some of the terms, perhaps many, are commonplace still some others nearer the theoretical conceptions "in Āyurveda is quite characteristic of the role played by the old ideas of the former in the formation of the latter." (Filliozat, 165) One interesting example (which will be elucidated later) can be cited here. Most of the surgical operations in *Suśruta Saṃhitā* are based on based on understanding of *marman* or 'vital/lethal spots' for easier understanding. These points should be understood as a junction or meeting place of the five organic principles of ligaments, veins, muscles, bones and joints. There are one hundred and seven *marmans*. Heart, head and *basti* (urinary bladder) are known as 'trimarma' because of their importance. Filliozat observes that Rig Veda employs this mostly in the reference to the killing of Vṛtra by god Indra. "The form is derived from the root *mṛ*, "to die", and it means above all a "mortal point."" (Filliozat, 164) The Āyurvedic texts have an extremely detailed catalogue of the marmans and they are, in general, quite easily identifiable, thanks to the precisions that are furnished. "They are most often the big vasculo-nervous packets or the tendons and the important nervous trunks." (Filliozat, 164) From all these facts it follows that the anatomy of the classical texts of medicine is, as far as the notions on the various canals and vessels or other organs of the body are concerned, a direct descendant of the Veda.

II Place of Surgery in Āyurveda

Anatomical organs in Āyurvedic texts

While writing in a European context Roger French traces the modes of acquisition of anatomical knowledge in ancient times "We may list the indirect ways of learning about the internal structure of man as follows: (1) analogy with animals; (2) inferences from the externally visible structures of man; (3) from natural philosophy as a whole; and (4) from function." (French, 1978: 10) Except natural philosophy which did not develop in ancient India the other modes of knowledge acquisition may be compared that in India. For a better understanding of the nature of medicinal knowledge in Āyurveda, it should be scrutinized what were the constitutive elements involved in the mechanisms of formation of this knowledge. Arguably, these may be derived from four sources – (1) knowledge of the herbs, (Das, 2001; Dey, 1896; Sharma, 1992a and 1992b; Whitney, 2002) (2) philosophical knowledge applied to the particular discipline of medicine,

(Dasgupta, 1991; Larson, 1987) (3) knowledge of religion and divinity, (Zysk, 2000a)[2] and (4) knowledge of the body proper. Regarding the last point Zimmermann comments, "Finally, in the analysis of the human body, two points of view are superimposed, one on the other." (Zimmermann, 1999: 169) Form the point of view of the 'materials of movement,' the humors are fluids irrigate the tissues. From the second point of view of health and disease, "they represent various facets in the combinative system of humors, savors, and qualities." (Zimmermann, 1999: 169) As a result, "the description makes it impossible to determine any anatomical locations with any precision." (Ibid, 166) Our following discussion will elucidate these questions. As we have seen in the *Institutes of Vishnu,* there is detailed enumeration of organs and bony structures of the human body. (Jolly, 1880: 283-287) Incorporation of this knowledge of anatomy in Indian medical texts is perhaps better understood by Edelstein's study in *Ancient Medicine*, "The value of a tradition can only be judged through a historical understanding of the time from which it derives and for which it is valid." (Edelstein, 1987: 249) Again, "Certainly knowledge of the body in antiquity is to be found not only among physicians, but also among philosophers and natural scientists... In antiquity, knowledge of the body is never exclusively professional knowledge, as it is now." (Edelstein, 1987: 260-261) Zysk, taking his cue from Edelstein, suggests that anatomical knowledge can be obtained in three ways: sacrifice, chance observation and dissection. Regarding anatomical knowledge in ancient Indian medicine, he has focused "on the methods by which this specialized knowledge was ascertained." (Zysk, 1986; Bhishagratna, Vol. I: vii-ix) The quartered animals at the Vedic sacrifices afforded excellent materials for the framing of a comparative anatomy. (*Aitareya Brāhmaṇa*, I. 2, II. 12, III. 37) "Sushruta devoted his whole life to the pursuit of surgery proper, to which he brought a mind stored with luminous analogies from the lower animals." (Bhishagratna, Vol. I: xv-xvi) Though Zysk admits, "the most impressive aspect of the earliest phase of anatomical knowledge is precision with which the lists of anatomical terms were recorded." (Zysk, 1986: 697) He also finds that the correspondence between "the underlying medical philosophies in the

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[2] *trividhamauṣadhamiti - daivabyāpāśrayaṃ, juktivyapāśrayaṃ sattāvavajayasca* [Therapies are of three kinds, viz., spiritual therapy, therapy based on reasoning (physical property) and psychic therapy.] *Carakasaṃhitā*, Sū, XI.54

teaching of Suśruta and in those of the Greek scientists and anatomists point to a Hellenistic origin of dissection in India." (Zysk, 1986: 694) While concluding with a critical translation of chapter five on the "enumeration and distinction of the bodily parts" in the book of anatomy of the *Suśruta Saṃhitā* he comments, "there is a definite lack of knowledge concerning the structure of the body which lies beneath the rib-cage. This has continued to the time of Ḍalhana (12th cent. A.D). The anatomists saw the tubes (trachea and oesophagus) descending into the lungs and assumed that one went to the lungs and the other to the heart." (Zysk, 1986: 702) In another insightful observation, "the heart-cavity (*guha*) is said again and again to be the dwelling place of the Atman or Puruṣa, variously described..." (Ewing, 1901: 265) The heart cavity does not find any anatomical position (in modern sense) within the body. It seems to be involved with Atman or Puruṣa which are not any concern for an anatomist. Zysk, in another paper, notes, "Ancient Indians identified organs resembling lungs (*pupphusa*, *kloman*) as part of human and animal anatomy, but they never understood their function in respiration." (Zysk, 1993: 198) Ancient Indians conceived of the lungs to be the locus of phlegm, and usually to be the seat of vital breath. The most important point to note here that whatever may be the amount of knowledge of surface anatomy and regional anatomy (based on *marman*-s), anatomical knowledge does not correspond with physiological activities. Both, to talk in a bit harsher note, are located in a *speculative cognition.*

It may, however, be argued that – (A) Āyurveda does not have any loan word from the Greek, so the question of Hellenistic origin of Āyurveda does not probably arise – "Indian physicians almost certainly had the opportunity to imbibe Greek medical ideas but apparently no motive" (Wujastyk, 2003: 396), (B) in Indian context, sacrificial practices of animal, which will be detailed later, possibly played the key role in the accumulation of anatomical knowledge (not chance observation or dissection as found in Greek practice), and (C) the two humoral theories of the Greek and Indians respectively seem to be distinctly different at their core and perception. Interestingly, a curious reference to the bones of the is found in *Caraka Saṃhitā*, "a patient is to be examined with reference to *saṃhanana* or compactness of the body...A compact body is characterized by the symmetrical and well divided bones, well-knit joints and well-bound muscles and blood. An individual having a compact body is very strong; otherwise he is

weak." (Sharma and Dash, Vol. II: 271) It is possibly conceivable that here the perception of body is compatible more with aesthetics of the body than with a medical body.

One more point may be brought to our notice. In *SS*, after instructing on the preparation of dead body and dissection to acquire proper knowledge of human body for surgery and treatment, the 5th chapter ends with – *śarīre caiva śāstre ca dṛṣṭārthaḥ syadviśāradaḥ // dṛṭaśrutabhyāṃ sandehamavāpohya caret kriyāḥ //* (Śā, 5.51) ["The vibhu (ātman), being extremely subtle, cannot be perceived with (normal) eyes, but only by means of (the sight acquired through) spiritual knowledge (jñāna) and penance (tapas) (5.50). An expert is one who has acquired practical and theoretical knowledge of the body; practice should be started after clearing away all doubts by seeing and hearing (5.51)." (Meulenbeld, HIML, IA: 253-254)]

Religious authority and its connotations are intertwined at the end with practical procedures of anatomical practices.

In his introduction to *Sushruta Samhita* Bhishagratna comments, "Suśruta recommends dissection on dead human bodies and suggests that it is only required of those who will practice surgery and that students of medicine can do without it." (Bishagratna, Vol. II: vi) He continues, "Suśruta's *Avagharshana* (the procedure enumerated in *Suśruta Samhitā*) is now considered by many as the only perfect mode of dissection ever known." *Avagharshaṇa* is a purely Indian procedure, although it has been sometimes compared with *hydrotomie* practiced by Lacauchie. (Mazars, 2006: 29)

Similar examples of preparing a dead body for anatomical dissection may be found in European experience too, "...the running water which cleaned the body as it disintegrated and the small creatures it contained which fed on it, seem to have played an essential part. The whole process is completed within a short time...Immersion in stagnant water, on the other hand, is followed by very gradual change..." (Kellett, 1964)[3] Nevertheless, needless to say, such procedures could only produce skeleton, bones, tendons and muscles before a naked eye. It was not possible to get into the interiors of the

[3] Detailed description of preparing a dead body through immersing in water will be found in J. L. Casper, *Handbook of Forensic Medicine, based upon personal experience*, trans. George William Balfour, Vol. II (London: New Sydenham Society, 1861), 261-265.

body and gain knowledge about visceral anatomy. King and Meehan comment in a different context, "ancient study of disease did not stress the solid organs, anatomical structure, or the changes therein." (King and Meehan, 1973: 517) As a result, "The association of clinical data and anatomical findings simply made no special impression... The time was not ripe for such an association." (Ibid, 527) Accurate localization of an organ inside the body was usually anomalous in ancient anatomical perception. Bhishagratna too does not fail to note anomalies in Suśruta, "To call it Descriptive Anatomy or Physiology is simply ridiculous. The *absence* of any reference to brain and spinal cord, to pancreas and heart, in a book of Anatomy and Physiology is unpardonable and in the Sārira-sthāṇa we feel this absence almost to *despondency*." (Bishagratna, Vol. II: iii) Regarding disease diagnosis in ancient Greek medicine, Ludwig Edelstein comments in a somewhat similar way, "In general, they explain disease by the humors in the body and by the way these are combined. Such a theory makes it unnecessary to take the internal organs or their form and character into account." (Edelstein, 1987: 266)

Let us now examine the section *Śārīrastahāna* in *Suśruta Saṃhitā* (SS). Among 120 chapters, 46 chapters are in the part of Definitive Aphorisms (*Sūtrasthānam*); 16 in the part dealing with the Etiology of diseases (*Nidānam*); 10 in explaining the Anatomy and physiology of the human body (*Śārīrasthānam*); 40 for Therapeutics (*Cikitsitam*); and 8 in the part dealing with poisons and their antidotes (*Kalpasthānam*). In addition to these, the *Uttara-Tantram* consists of 66 chapters. Amongst these 186 chapters, only a part of chapter V is devoted to the study of dissection and that too only how to prepare a dead body for dissection.[4] It is taught "A pupil, otherwise well read, but uninitiated into the practice (of medicine or surgery) is not competent to take in hand the medical or Surgical treatment of a disease." (Bhishagratna, Vol. I: 71)

Practical surgery "should be taught by making cuts in the body of a Pushpaphala (*Benincasa cerifera* a kind of gourd), Alāvu (*Lagenaria vulgaris*), watermelon (*Citrullis lanatus*), cucumber (*Cucumis sativus*), or Ervāruka (*Cucumis melo*)"[5] and not only that

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[4] Julius Jolly (1977) comments, "Some sort of dissection is mentioned only in *Sū., 3.5*...Since this procedure is recommended only to the surgeon, the anatomical knowledge thus received may not obviously be considered as necessary for the treatment of cases of other than surgical one." 55.

[5] For scientific names used here see, *Suśruta Saṃhitā*, ed., P. Ray, H. N. Gupta and Mira Roy, 1993, 85.

"The art of venesection (Vedhya) should be taught on the vein of a dead animal, or with the help of a lotus stem. The art of probing and stuffing should be taught on worm (Ghuna) eaten wood, or on the reed of a bamboo, or on the mouth of a dried Ālāvu (gourd). The art of extracting should be taught by withdrawing seeds from the kernel of a Vimbi, Vilva or Jack fruit, as well as by extracting teeth from the jaws of a dead animal." (Bishagratna, Vol. I: 71-72) Finally, this particular knowledge is applied in surgery only in terms of *marman*. Actual surgical practices are nowhere mentioned or described.

Before our conclusion is drawn, we should be aware of some other important features of SS. Importance of surgery is expressed thus – "It is pre-eminent too on account of its quick action, owing to the use of sharp and blunt instruments (śastra, yantra), caustic (kṣāra), and cautery (agni). [SS. Sū, 1.17-18] (Meulenbeld, IA: 203)

The crucial problem arises with a mnemonic verse of śārīrasthāna (5.46) –

tvakparyantasya dehasya yohyam aṅgaviniścayaḥ //

śalyajñānādṛte naiṣavarṇyatehaṅgeṣu keṣucit //

Every one from Hoernle to Meulenbeld has translated this passage as containing knowledge about the body, i.e., anatomical knowledge. Here, the basic problem erupts with the term *śalyajñānād*. Usually, this term is accepted for anatomical knowledge. Only exception is Fiser and Fiserova's article. (Fiser and Fiserova, 1963) *Śalya* actually means "a dart...shaft (also the point of an arrow or spear and its socket), anything tormenting or causing pain...or (in med.) any extraneous substance lodged in the body and causing pain...and, as a branch of medicine, to 'the extraction of splinters or extraneous substances'...." (Monier-Wiliams, 2002: 1059) In Apte's dictionary, the fifth meaning of *śalya* is "Any extraneous substance lodged in the body and giving it very great pain." (Apte, 1985) All these meanings are relevant for a surgeon (*śalyahartar*) in India. To some authors, "It may as well be added that they (surgeons) were perfectly acquainted with the anatomy of the goat, sheep, horse, and other animals used in their sacrifices. Early warfare was conducted with *such weapons as bow and arrow*, sword, mace, etc.Thus in every war the services of bold and skilful surgeons were always in requisition for extracting arrows, amputating limbs, arresting haemorrhage, and dressing wounds." (Sinh Jee, 1896: 179-180) Kunte observed, "surgeons...extracted the shafts of arrows lodged in the body and dressed wounds which the ancient Āryas dreaded much,

because, before they went to war, they donned coats of mail, cuirasses and helmets." (Kunte, 1902: 4)

Now it may be prudent to remember Edelstein, "In antiquity, knowledge of the body is never exclusively professional knowledge, as it is now." The next mnemonic verse of *śārīrasthāna* (5.47-48) sheds light on "certain (niḥsaṃśaya) knowledge" of anatomy. Meulenbeld translates the passage, "A surgeon (śalyahartar), who wants to acquire certain anatomical knowledge, should, with that in mind, thoroughly examine a dead body, after cleansing it, for increase of knowledge arises from the combination of perception (pratyakṣa) and study of the science." (Meulenbeld, IA: 253) The verse is –

tasmānniḥsaṃśayaṃ jñānaṃ hartrā śalyasya vāñchatā //
śodhayitvā mṛtaṃ samyagdraṣṭavyohaṅga viniścayaḥ // (47)
pratyakṣato hi yadṛṣṭaṃ śāstradṛṣṭaṃ ca yadbhavet //
samāsatastadubhayaṃ bhūyo jñānavivardhanam // (48)

Here too remains the problem of translation. In Fiser and Fiserova's translation, "Therefore, anyone who strives after acquiring a safe knowledge of *śalya*, must prepare a dead body, and examine its parts in the right way." (Fiser and Fiserova, 1963: 313) We have seen before that *śalya* should not be confounded with anatomy. This term is more concerned with surgery. Moreover, Hoernle provides us with a *varia lectio* in Bodleian MS., No. 739 and India Office MS., No. 1842. The variant reading is – *icchatā śalya-jīvinā*, instead of *śalyasya vāñchatā*. (Hoernle, 1994: 225-226) It clearly denotes a physician "who lives on surgery" (*śalya-jīvinā*).

Zysk points out to the fact that "a violation of the dead person's sacredness seems purposely to be avoided that rather than cutting into the corpse with a scalpel (śastra)... Suśruta instructs that practice should be carried out on fruits, gourd skin, water-bags, stalks of plants and the like." (Zysk, 1983: 188) It makes us aware of the presence of a surgeon, not an anatomist. If this is the situation, we have to confront and resolve a few questions – (a) how this knowledge of *śalya* was practiced, (b) without having knowledge of anatomy how ancient physicians or surgeons managed to do surgery, and (c) how it came to an end.

After the mnemonic verses, the next part of *śārīrasthāna* is composed in prose. In ancient medical texts, mnemonic verses were written for memorizing theory, while

practical lessons were written in prose. In the next prose section there is thorough discussion on how to prepare a dead body for dissection – "For this purpose, a corpse should be selected which is intact, originating from a person who has not died from poison, has not suffered from a disease for a long time, and has not lived until a very old age. [The text has *avarṣaśatika*, i.e., one who has not attained the maximum span of life of hundred years.] (Meulenbeld, IB: 375, note 151) The corpse, with the intestines and their contents removed, should be wrapped in coverings of muñja grass, bark, kuśa grass, śana (hemp), or any other suitable material, and placed in a running stream, kept within a cage (pañjara), at a place where it is not easily noticed; it should be left there in order to decompose; then, after seven days, one should take it for examination, very gradually scrapping away all the tissues, beginning with skin, and, subsequently, the major and minor external and internal parts of the body which have been mentioned; the scrapping away should be carried out by means of a brush (kūrca), made of uśīra grass, animal hairs (bāla), veṇu (bamboo), balbaja grass, or any other suitable material. (5.49)" (Meulenbeld, IA: 253)

This particular procedure, termed as *avagharṣaṇa*, has been discussed earlier. Rahul P. Das cites reference from later texts on the particular procedure of *avgharṣaṇa* in later Āyurvedic text of Vāgbhaṭa. (Das, 1983) Curiously enough, it may be mentioned that there was the use of black ants whose mandibles serve as staples for suturing a wound. (Mazars, 2006: 70-71) What is missing in this entire discussion is the use of any knife. The described way of treatment without the use of a knife by a simple scrubbing with a whisk made of the roots of *Andropogon muricatus* (uśīra grass). Fiser and Fiserova note, "there is no other instance of a dissection without knife, known so far." (Fiser and Fiserova, 1963: 316) However, in sūtrasthāna of Suśrutasamhitā there are mentions of *śastra*-s and *yantra*-s. (Sū, 1.7 and 1.8) Various types of knives are described there. For our present purpose, we are concerned with the use of knife only in case of dissection.

Now, the relevant question comes up – what could the ancient Indian physicians and surgeons actually observe by employing the described method of dissection? We have some plausible answers – (1) this kind of examination of human bodies provides the dissecting surgeon with some amount of rough information on soft tissues, and (2) he could possibly examine the tendons, ligaments, vessels muscles etc. wherefrom he could

be able to get an idea of their course. "Nevertheless, he could not distinguish them from each other, and estimate their physiological functions; he merely learned that *these structures are not to be damaged in the course of an operation.*" (Fiser and Fiserova, 1963: 321) Here remains an answer to our previous question – without having the knowledge of anatomy how the ancient physicians or surgeons managed to do surgery. It was done with aid of the knowledge of *marmans* – having been discussed before and, also, in the following part. Such sort of surgical dexterity was palpably present even during the colonial period in India as we have seen in our Introduction.

Coming to this conclusion the entire knowledge of practical dissection and surgical practices seems to be ephemeral. It remains no longer a textbook of surgical guidance. Surgical guidance is replaced by the knowledge of regional anatomy. "Surgical operations demanded a knowledge of regional anatomy rather than elaborate and often unnecessary and tedious descriptions of all the structures of the body. The place of regional anatomy was supplied by the concepts of *marmas*." (Kutumbiah, 1999: 33) Moreover, Suśruta's *marman*-theory seems to be a synthesis of different and partly overlapping systematic and anatomical concepts, among which the theory of bodily constituents as the most comprehensive one became the model for *marman*-theory. (Maas, 2008: 142)

Now we can try to address the question of decline of surgery in India. Zysk has convincingly argued about Hinduization and Brahminization of Indian medicine. (Zysk, 2000a) Chattopadhyaya also provides some insights into this issue. (Chattopadhyaya, 1977) One of the most authoritative Brahminic text the *Manu Saṃhitā* (Laws of Manu) states, "The food of a physician is (as vile as) pus, that of an unchaste woman (equal to) semen, that of a usurer (as vile as) ordure, and that of a dealer in weapons (as bad as) dirt. (4.220)" Engler argues, "Ayurveda simply does not manifest characteristics of modern science in anything more than a vague analogous sense." (Engler, 2003)

Interestingly, after the full discussion on how to prepare a dead body for medical knowledge and training we find in *śārīrasthāna* (5.50) –

na śakyascakṣuṣā draṣṭuṃ dehe sūkṣatamo vibhuḥ /

dṛśyate jñānacakṣurbhistapaścakṣurbhireva ca // [The vibhu (ātman), being extremely subtle, cannot be perceived with (normal) eyes, but only by means of (the sight acquired through) spiritual knowledge (jñāna) and penance (tapas).]

Zysk finds Suśruta "Speaking in terms of Vedānta (as interpreted by the 14th cent. commentator Ḍalhana)" and "exposing the internal parts of the human body will never reveal (or harm) the inner soul or self (Ātman) whose correct understanding is gained rather from the religious practices pertaining to sacred knowledge and from ascetism." zysk, 1983: 188) Vibhu is Ātman, the spiritual self of Vedānta. While discussing elements of ritual practices in Vāgbhaṭa's text, Benner finds "It is therefore not always possible to clearly and sharply distinguish ritual and medicine." (Benner, 2009) To describe the characteristics of an individual (because Āyurveda "suggests a purely male view of the body") the Sāṃkhya system of philosophy is invoked for the creation of a man out of assimilation of Puruṣa and Prakṛti. (Wujastyk, 1998: 5)

With the above-mentioned passage in mind, it is understandable that spiritual knowledge finally overshadows the craft of dissection. Embedded within such a social milieu in ancient India, surgical practice was relentlessly relegated to the margins and to the low-caste people like barber potter etc. High caste physicians would only practice textual and scriptural medicine, without ever touching the body. Truly speaking, there is not single conception of the body in Indian medicine (Āyurveda), but a dominant one. When a physician would examine a patient, he would go on reciting mnemonic verses related to the bodily organs. As a result, it appeared that there was no break. In this unique situation, anatomical knowledge seems to have been continuing since time immemorial. With this conception of the body and a unique theory of causation of disease there was no need of dissection at all.

Let us now examine the etiopathogenetic process of a disease as conceived in Āyurveda. In Āyurveda, prodromes (*pūrvarūpa*) develop into full-fledged symptoms (*rūpa*). Secondary affections (*upadrava*) are consequences of the basic morbid process. At the end of this process, recovery takes place or fatal signs (*ariṣṭa*) appear, foreboding death. Each stage is characterized by a cluster of signs. In many cases, the enumeration of these signs occurs in the form of verses, more easy to remember than statements in prose. (Meulenbeld, 2008a: 612-613) According to Sharma, the entire process of pathogenesis

occurs through the following six stages: 1. Sañcaya (accumulation), 2. Prakopa (aggarvation), 3. Prasara (dissemination), 4. Sthānasaṃśraya (localization), 5. Vyakti (manifestation) and 6. Bheda (explosion). It is easily understandable that in this explanatory model of disease causation there is no need of anatomical knowledge or dissecting a body. It emanates from an entirely different conceptual framework. (Sharma, 1998: liii-lv)

Illustration of the now famous 'Āyurvedic man' may help us to clarify the issue. We shall find in this illustration a 'body frame' (i.e. two-dimensional body) without any depth or volume or accurate localization of the internal organs (i.e. three-dimensional body) of modern anatomical knowledge. Wujastyk observes that the body to which Indian medicine addresses itself is the physical body as understood to the senses and to empirical examination. (Wujastyk, 2003) There is another point worthy of mention. Though there are descriptions of bones and various organs inside the body their positions and functions are always described with respect to humoral pathology of the body. Even when Suśruta gives description of any operative procedure he does it with the aid of *marman* points – not any bony reference. For example, "An incision should be made at the spot of a finger's width remote from the Urvi, Kurcha-Śirā, Vitapa, Kaksha and a Pārśva-Marma..." (Bhishagratna, Vol. II: 187)

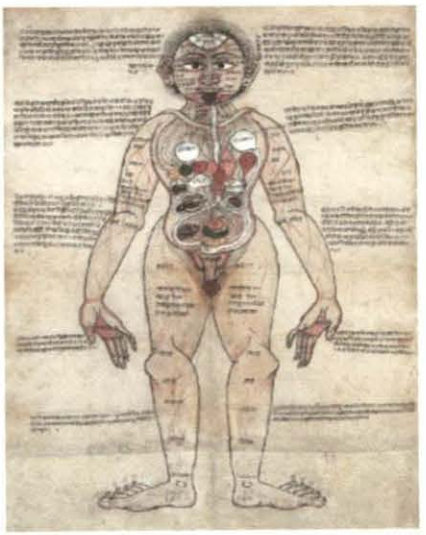

Fig. 7

[This image is entirely drawn from the Āyurvedic understanding of the human anatomy, unlike other Indian images of the human body. The channels and organs drawn on the

torso are specified as in Āyurvedic literature, with organs named as receptacles for one or other of the organic fluids. However, the organs in Āyurveda are seen in a much wider context than in the West. They are the seats of the humors (wind, bile and phlegm) and do not generally engage in the kind of processing which modern western biomedicine expects of an "organ"[6]. Nepalese; c.18th/early 19th century.

Courtesy: Wellcome Library no. 574912i. (Image no. V36133 or L17592)]

Wujastyk has recently critically studies this illustration. (Wujastyk, 2008) We find astonishingly accurate account of the bony details in āyurvedic anatomy, but lack of details and anatomical localization of the organs inside the body. *Śārṅgadharasaṃhitā* (ca. 1300) gives a standardized and clearly presented version of anatomical organs. It enumerates: 7 receptacles, 7 body tissues, 7 impurities of the body tissues, 7 membranes, 900 sinews, 210 ligaments, 300 bones (as against 206 bones in actual estimate the number of bones varies between Caraka and Suśruta being 360 and 300 respectively), 107 lethal points, 700 ducts, 24 pipes, 500 muscles (21 extra ones for women), 16 tendons, 10 orifices of the male body, 13 orifices of the female body. (Wujastyk, 1998: 319) In another study there are 90 tendons. (Rao, 1968) We must note that these are all gross structures that can be observed, accurately or inaccurately, with superficial, yet keen, observation by the unaided eye. In case of a more minute and deeper observation Caraka stressed on the difficulty to correctly count the number of minute parts of the body, "the parts of the body cannot, however be counted because they are divided into tiny atoms (*paramāṇu*), and these are too numerous, too minute, and beyond perception." (Nag, 1994, Vol. II: 269; Wujastyk, 2003) Caraka counts 14 bones in the breast, as Indian anatomists counted cartilages as new bones. While in Suśruta and Vāgbhata I, the same curiously stands to be 8. The windpipe too is regarded as a bone. (Dasgupta, 1991: 286) The Indian anatomists followed a novel method in their count of ribs. The costal cartilages were counted as separate bones.

According to Hoernle, Suśruta's list of bones can be compared with that of Caraka along five points – (a) The Principle of Position, (b) The Principle of Homology, (c) Alteration of Terms, (d) Alteration of Items, and (e) Alteration respecting Structures. (Hoernle, 1994: 72-74) Occasionally nerves and muscles were confused with ligaments.

[6] For a comparative study of the 'Āyurvedic man' with the anatomical body, see, Bhattacharya, 2008.

The standing puzzle of Indian anatomy and physiology is the classification of *śirās*, *dhamanīs* and *srotas*. "All subsequent attempts at clearing up this puzzle have resulted in greater confusion. The chief difficulty lies in the fact that every writer on the subject approaches the problem with preconceived ideas and tries to read his own vies into the ancient texts." (Kutimbiah, 1999: 27)

It is known that there are differences in counting the number of bones in a human body between Caraka and Suśruta. While Caraka counts it to be 360, in Suśruta's estimation it comes to be 300. Interestingly, Caraka's number corresponds to the number of days and nights in a year - "And there are three hundred and sixty nights in the year, and three hundred and sixty bones in man, and these (two) now are one and the same..." (Eggeling, 1900) Hence, it may not be an oversight that the method of counting bones and organs in Caraka possibly is more at compliance with season and months than true dissection and observation of dead bodies. In works like Śārira Padmini and Bhāva Prakāśa, the number of bones comes to be 300. (Hoernle, 1994: 90) Vāgbhaṭa I does not have his own ways of counting. Rather, he puts his efforts to combine both the systems, sometimes, in a curious way. It may be worthwhile to have an understanding of *añgas* (parts) and *pratyañgas* (sub-parts) of the body from *Caraka Saṃhitā*. Among all of the organs "The site of consciousness is only one, viz. the heart... In the six *añgas* (parts) of the body there are about 56 *pratyañgas* (sub-parts)." (Sharma and Dash, Vol. II: 545-455) Further, beyond what is described above can be ascertained only from inference only – *snāyu* 900, *śirā 700*, *dhamanī* 200, *peśī* (flesh), *marma* (lethal/vital parts in the body) 107, *sandhis* (joints) 200 in number. [The terminal openings (mukhāgra) of the minute branches of śirās and dhamanīs, as well as the hairs of scalp, face and body are 29, 956 in number (7.14). (Meulenbeld, IA: 45)] To emphasize, Caraka differentiates between 'gross bodily matters' and 'body images.' Solid matters like nails, bones, teeth, flesh, skin etc. Beyond these remain apertures of the body and big and small *srotas* which can only be sensed. *Manas* (mind) and *buddhi* (intellect) are included among body images. "The view that the composite body is one which leads to attachment (saṅga), the insight that its parts are separate to final emancipation (apavarga)." (Meulenbeld, IA: 46)

Another point related to the specific location and function of an organ may be illustrated here. "Ancient Indians identified organs resembling lungs (*pupphusa*, *kloman*)

as part of human and animal anatomy, but they never understood their function in respiration. They conceived the lungs to be the locus of phlegm, and usually the heart to be the seat of vital breath." (Zysk, 1993: 198) This analysis reminds us again of the anomalies between location and function of a particular organ in Āyurvedic texts. Again, breath or *vāyu* or *prāṇa* has very old Rig-Vedic origin and it "stands side by side with *jīvana*..." (Ewing, 1901: 250)

From these ongoing discussions it may be possibly extrapolated that the body Āyurveda is constructed not as a material body (as in modern medicine), but as combinations and dissociations of many body images. This is a bodily frame through which saps and humors – *doṣa*-s, *dhātu*-s and *mala*-s – flow. But as a result of primarily observing the body parts of sacrificial animals and collecting human bones after cremation on the one hand, and, possibly, the buried bodies of the children below 2 years of age, wounded bodies in wars and maybe dissecting bodies in some exceptional cases bodily organs were listed, bones were described and pupils were taught to learn the knowledge of medicine. Even with insufficient and deficient anatomical knowledge the description of the body was essential because human being – the central figure of this beautiful world – was in need of treatment.

When comparing with Greek medicine, "One must, however, realize in what respect the physician's concern with the body differs from the concern of the philosophers and natural scientists and from the general knowledge of these things." (Edelstein, 1987: 261) Indian medicine has borrowed from various philosophical schools, but these philosophical doctrines have been reconstituted according to the need of healing practices. Despite this fact, and bereft of in-depth study of anatomy, it appears that many a time this healing tradition is again lost into philosophical debates not so relevant to the understanding of the 'gross body' or *sthula śarīra*. It will be evident from the following observation of Caraka, "Minutest units (cells?) into which all organs are known as *paramāṇus* and they cannot be counted because (1) they are extremely numerous (2) they are extremely subtle and (3) they are beyond sensory perception. *Vāyu* and the specific nature of the results of the past action associated with these *paramāṇus* are responsible are responsible for their union and disjunction." (Sharma and Dash, Vol. II: 461) It becomes perhaps evident that old authors are not talking about atoms or *paramāṇus* in

modern sense on the one hand, and, on the other, for obvious reasons, there cannot be any clear understanding of what these *paramāṇus* are. Consequently, failing to explain the interiors of the body and its functions thereby they are taking recourse to some philosophical puzzles, at least attributed on the old texts by their commentators, and redactors as suggested by Meulenbeld, Debiprasad Chattopadhyaya and others. Zimmermann brings to our notice, "we, as the heirs of Greco-Latin logic, proceed by way of description and argument; each heading announces the account of a particular line of research. Osteo-logy, physio-logy, patho-logy: the suffix itself indicates an objective approach, a distinction drawn on principle between researcher and his field of study." (Zimmermann, 1999: 96) Again, this situation is fundamentally different in Āyurveda. In ancient India, the primary material of knowledge was constituted by the *recitation of series of words* of a more or less stereotyped nature. Finally, he comments, "There could be no zoology in the minds of the Indian scholars, no osteology or physiology." (Zimmermann, 1999: 96) In Indian medical texts, as seen in so many examples, there are numerous instances of misinterpretation of the anatomical terms through ages. One more example – it is only as late as the sixth or seventh century A. D. that, owing to a misinterpretation of the anatomical terms *sandhi* and *aṃsa*, the windpipe or *grivāh* (in the plural) appeared to mean clavicle. (Dasgupta, 1991: 286) It strongly points to absence of any standardization as well as non-uniformity of nomenclature and, in consequence, lack of uniform understanding across different time and space. These terms had contextual meanings only. On the contrary, Latin or Greek terms used in Western anatomical descriptions could avoid such basic problems for scientific terms in international usage. Moreover, conscious efforts have been made to ensure uniform usage, particularly, since 1895. Besides, following works of Morgagni and Bichat, the doctrine of diseased organs "replaced the classical concepts of illness enshrined in the corpus of Hippocrates." (Warren, 1999: 1161) Changing concepts regarding natural world and generation of technical terms went hand in hand in European context. "A philosophy based on particles, action by contact, and denial of purpose could not have the traditional interest in gross anatomy." (French, 1993: 91)

Surgical Instruments and Appliances

Despite all these facts, the surgical and allied branches in the Ayurvedic system of medicine became highly specialized. About 125 instruments and appliances of various sorts were accurately described. These included knives, scissors, syringes, hooks, forceps, trocars, needles, etc. From a detailed description of the appliances, modem medical research workers have been able to recognize the instruments as such. Medical students were instructed in the use of these. Some specimens of surgical instruments used by the surgeons of ancient India may be reproduced.

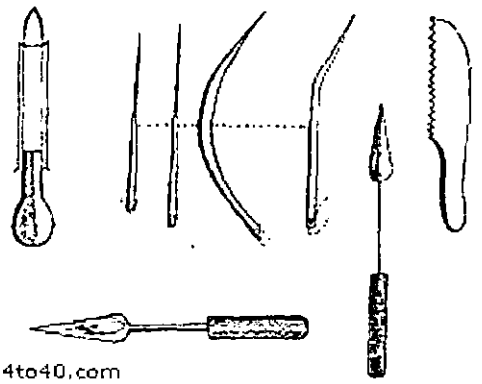

Fig. 8

Courtesy: Google Images

Operations for anal fistula, tonsillectomy, amputations and excisions, couching of cataract, obstetric procedures, venesection, ligation of blood vessels were all described and taught to students. Trephining of the skull and eye operations were also described. (Rao, 1968) Of particular exception was the practice of plastic surgery. It was fairly developed in ancient India and Europe had most likely followed this line of technique during the initial phase of development of modern plastic surgery. The plastic operations of otoplasty (plastic surgery of the ear) and rhinoplasty (plastic surgery of the nose) are described (as discussed earlier) in the 16th chapter of the first book (Sūtrasthānam) of the compendium. First, methods are described for piercing the ear-lobes of an infant which still is a widespread practice in India. Often these ear-lobes, due to the use of heavy ornaments, get considerably expanded and ultimately sunder. Suśruta has described 15 methods of joining these cut-up ear-lobes. For these plastic operations, called Karnabandha, a piece of skin was taken from the cheek, turned back, and suitably stitched on the lobules. Further treatment of the operation, periodic dressing of the wound and the use of various ointments are elaborately described. There are descriptions of so

many other surgical methods. Some of them are – *agnikarma* (cauterization by application of heat), *kṣārakarma* (alkali-cauterization), *śonitāvasecana* (blood-letting), *śalyaśāstra* (removal of foreign bodies and obstructions) etc. *Śalyas* (darts or embedded materials) "may be intrinsic or extrinsic in origin." Intrinsic *śalyas* are due to "local accumulation of deranged *vāyu*, *pitta*, or *kapha*." (Ray, Gupta and Roy, 1993) Two points may be noted here – first, despite description of anatomical organs the surgical theory is finally guided by the doctrine of *doṣa*, and, second, most of the surgical procedures described could be performed without any sound knowledge of anatomy i.e. knowledge of regional anatomy could solve the problems like blood-letting, venesection (Thatte, 1981), or bone-setting. Similar examples can be found in medieval and 18th – century Europe when surgeons were within the category of barber-surgeon. Perhaps the most striking example of this can be had from a case of rhinoplasty (previously discussed in detail), which is supposed to be very sophisticated plastic or cosmetic surgery. In India this was a family craft. Persons totally untrained in anatomy would do this practice. Experiential knowledge accumulated over generations could give amazingly good results of this operative procedure.

Interesting historical evidence, in continuation of the discussion in Introduction, can be cited here. Dr. J. Ward, a witness to an act of rhinoplasty in 1815 in Bombay (which was being practiced as a family craft along the lineage of ancient technique), wrote to his superior:

> DEAR SIR,
>
> In consequence of the conversation I had with you last night about Cowasjee, who had a nose put on at Poonah, in the presence of Mr. Uhthoff and myself, when we belonged to the suite of the late Sir Charles Warre Malet, then ambassador at the above court, I beg to inform you, that the same people who put on the nose said, they were also in the habit of putting on lips; and wanted to perform that operation on the eldest son of our native ambassador at the Paishwah's court, who had lost part of his upper lip: but to this he would not although they told him they agree, had frequently done it with success.
>
> I am,

Dear Sir,

Your obedient humble Servant,

J. WARD.

November 12th, 1815. MR. CARPUE. [Gaspar Taliacozzo, Bologna, 1546–99: pioneer of nose repairs.][7]

Time and space as perceived in Āyurveda

Some of the basic metamorphosing features of modern medicine marked by new knowledge of anatomy, technologies and beneficial practical surgeries may now be touched upon. In *CS*, kāla or time, in relation to disease-production, is described as of two types: *nityaga* and *āvasthika*. *Nityaga* is thought to be related with season and *āvasthika* is related with disease. Again, it is stated – *kāla punaḥ saṃvatsarascāturāvasthā ca*. [*Kāla* or time connotes two meanings, viz. the year and the state of the disease in the patient.] Further, *kālohi nityagascāvasthikasca: tatravasthiko vikaramapekṣate, nityagastu khalu ṛtusātmyapekṣaḥ //* [*Kāla* or time is of two kinds – *nityaga* (which flows perpetually) and *āvasthika* (time as a phase). *Āvasthika* is related to disease, while *nityaga* is related to seasons, days and nights in which wholesomeness of a person is determined. (Sharma and Dash, Vol. II: 73)]

Mazars comments, "Here it is subjective time as perceived by the patient and on which the physician is capable of acting by prescribing a treatment and a diet which are both appropriate to the season and to the state of the development of the disease..." (Mazars, 2006: 28-29) He continues, "This conception of time is at the root of a certain number of notions which in Āyurveda, are related to biological rhythms." It should be noticed that time in this description is not something abstract mathematical unit. It is intimately related with natural rhythm on the one hand and the 'microcosmic' representation of the human body. Time in such context is always embedded, not extracted out of embodiment. It has got nothing to do with scientific, mathematical time.

Regarding space, Carakasaṃhitā informs –

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[7] Wujastyk, *Surgery in Ancient India*. Reference: http://www.ucl.ac.uk/~ucgadkw/uclma/surgery-slides-pdf.pdf.

deśa punaḥ sthānaṃ, darvyāguṇāmutpattiprcarau deśasātmyaṃ cācaṣte; (Vi. 1.22.5) [*Deśa* means space. The knowledge about origin, circulation or movement and *deśasātmya* (acclimatization to a region) of *dravya* (substance) can be obtained from *deśa*.] It must be noted that space in this explanation is never used as a category to understand the body, rather the inside of the body. On the other hand it signifies the space or habitat wherein a whole person or a human being is situated. This question will be dealt with at a greater length later on. In *SS*, time (Kāla) is represented thus: "The Sun-god, by his peculiar motions, divides eternal time which is measured by years (Samvatsaras) into increasingly progressive but smaller subdivisions such as, Nimeshas (lit: - time taken for closing eyelids), Kāsthās, Kalās, Muhurtas, days and nights, fortnights, months, seasons, solstices, years and Yugas. Time taken in articulating any of the short vowels (such as A, etc.) is called an Akshi-Nimesha. Fifteen Akshi-Nimeshas make one Kāsthā. Thirty Kāshthās make one Muhurta. Thirty Muhurtas make one day and night. Fifteen days and nights make one fortnight. A fortnight is either dark or bright. Two fortnights make one month." (Bishagratna, Vol. I: 45-46) These are the smallest units of time we find related to medical practice.

In *jyotiṣa śastra* time measurement proceeded along the almost similar line. [124 *kās thās* = 1 *kalā*, 20 and 1/10 *kalās* = 1 *muhūrta*, 30 *muhūrtas* = 1 *ahorātra* (day and night), 2 *parvans* = 1 *cāndramāsa*, 2 months = 1 *ṛtu*, 2 *ayanas* = 1 year.] "Time is self-existent (*svayambhū*), without beginning, without end, and without middle. Even the minutest fraction of time is ever-existent...The functions of time succeed each other perpetually like the different parts of a revolving wheel. This wheel of time (*kālacakra*) revolves eternally with continuous change. Time is reckoned and measured by the motion of the sun in the heavens." (Ray, Gupta and Roy, 1993: 19)

One characteristic of Sanskrit language – the receptacle of medical texts in India – may be mentioned here. In the classical Indian languages, there are no words which corresponded to the concept "to become." The verb formed from the root **bhū** can be translated as both "to become" and "to exist." These two aspects of perceived reality, conceived as antithetical by the Western mind, are not even distinguished. "To become" is merely an aspect of "to exist." The noun **bhava**, formed from the same root, can mean either "being born" or "existing", in other words, to become is to be born. To express the

idea of change at all, Indians had to make shift with the words **anyatha bhavati** or **anyathabhava** "being otherwise." Becoming is expressed in terms of being, dynamic is seen as a phase of static. The point of view permeates the language. The noun, which expresses the more stable and unchanging aspects of a thing, is in Sanskrit more likely to be used than the verb, and correspondingly adjectives are more frequent than adverbs. In classical Sanskrit, indeed, especially in prose writings, it became usual to employ verbal nouns or participles instead of finite verbs. For example, the sentence "Because of the rain, the food appears" is expressed in classical Sanskrit as "Because of the rain, appearance of the food (is possible)." It has been the practice since ancient times to use the participial form instead of the finite verb to express the past tense, and it became a common expression in colloquialism of the later periods. Sanskrit will also use an adjective, which is static in feeling, to express an idea which might take a verb in the languages of the West. "The classic Western expression of the sense of flux uses a vivid and specific verb. "All things flow" (pa/nta rei), The corresponding idea is expressed in Sanskrit as **sarvam anityam**, "all existences are impermanent." (Ess, 2000)

In India, medicine, like everything else, was inextricably linked to larger rhythms and to the community. (Lee, 2000) Contrarily, in scholarship in the Western tradition the sensitivity for temporal ordering dominates more and more. (Houben, 2002: 473) It may be illustrated by the fact that in the classical Indian languages, there are no words that corresponded to the concept "to become." The verb formed from the root *bhū* can be translated as both "to become" and "to exist." These two aspects of perceived reality, conceived as antithetical by the Western mind, are not even distinguished. The classic Western expression of the sense of flux uses a vivid and specific verb "All things flow". The corresponding idea is expressed in Sanskrit as *sarvam anityam*, "all existences are impermanent." To connect two ideas, Western languages use such conjunctions as and or then; Sanskrit, in contrast, will express the same idea by adding the demonstrative pronoun *sa* to the subject of the sentence, as if "John runs and jumps" were to be expressed as "John running he jumping." The conjunction emphasizes the separateness of events; the demonstrative focuses on the subject, unchanging through time. This particular inherent structure of Sanskrit texts might thwart the question of scientific structuring of time measurable in small quanta for well-structured patients' history. Time

perceived to the level of a fundamental principle probably reflects the development of an agricultural economy. (Nakamura, 1992: 64) In precolonial India, measurable time had a minimal role to play in the everyday life of the majority, nor was there anything like state-regulated time.

Coming to the colonial period, time measured with precision, and uniform over a defined space, was considered necessary for modern systems of regulation. "The subjective experience of life-cycle time could now be projected into a new *epistemic* domain rendering it objective, measurable and linear." (Kalpagam, 1999)

While applied to the modern medical body this particular notion of time is signified in a quite different way "The essence of Sir Francis Bacon's 17th-century conquest and dissection of nature was the transformation of time from static, ever-repeating cycles to linear progression. Modern science was made possible by the clock. Modern, scientific time is a one-way street, going from point X to point Y and never coming back." (Lee, 2000) The sense and sensation of time are central to the differences between traditional and scientific medicine. Older units of time were transformed into universal, scientific quanta of time like second, minute and day. "The next significant technology of medicine to use time as its orienting focus is the clinical chart... Clinical charts thus provided clinicians with a comparative and comprehensive perspective on how their interventions influenced the illness, and so became visual health outcomes records." (Reiser, 2000: 33) We should recall that (a) examination of pulse was reframed within a rubric of "universalized" time, rate/minute, though, not in its descriptive character as practiced by the āyurvedic healer (Lad, 2007), and (b) the use of stethoscope was instrumental to diagnose anatomo-physiological dys-functions inside the depth of the body (i.e. organ localization of disease) and ushered in miraculous *therapeutic* results instead of *prognosis* in āyurvedic practice. And, to add, all these were results of accurate anatomical knowledge of modern medicine. Now the question of space relevant to the discussion of the body and therapies may be discussed.

The Nyāya-Vaiśeṣika philosophical school has greatly influenced the doctrines of Āyurvedic understanding of nature of body and substances. Following this philosophical system, "the *Caraka-saṃhitā*... enumerates the five elements, *manas*, time, space and the self as substances (*dravya*)." (Dasgupta, 1991: 369) *Caraka-saṃhitā* further states, "A

patient is the very space or *kāryadeśa* for administering therapies." (Vi, 8.94) Again, "*Deśa* (Habitat): - Both the land as well as the patient constitutes *deśa* or habitat." (Sharma and Dash, Vol. II: 254) The patient is to be examined "with reference to *pramāṇa* or the measurement of his bodily organs. This is determined by measuring the height, length and breadth of the organs by taking the finger breadth of the individual as the unit of measurement." (Ibid, 272) Some of these measurements are such – feet 14 fingers, knees 4 fingers in height and 16 fingers in circumference, thighs 18 fingers in height and 30 fingers in circumference, heart (*hṛdaya*) 3 fingers etc. The entire body is 84 fingers in height and 84 fingers in breadth. Sharma and Dash comment, "There is difference in the statement of the Suśruta and the Caraka regarding the height of the body. According to the former, it is 120 *añgulas* whereas according to the latter it is only 84 *añgulas*. This is due to the difference in the measurement of the basic unit i.e. *añguli* which is smaller according to the Suśruta from what is described here (i.e. in the above mentioned measurements)." (Ibid, 275)

All the measurements, as already discussed, are normalized and in harmony with natural metaphors. In *Śārṅgadhara-saṃhitā* –

jālāntaragate bhanau yat sūkṣaṃdṛśyate rajah /

tasya triṃśattamo bhāgaḥ paramāṇuḥ sa ucyate // (Pū, 1.15) [When the rays of sun enter through the window and the minute particles are observed thereby, the thirtieth part of that very particle may be called as an atom.] These smallest parts of the objects found in nature are taken for measurements. There different schools of measurements too in *Śārṅgadhara-saṃhitā*. Whatever comes as an explanation of differences in the bodily measurements according to two of the *Bṛhattrayīs*, the fact remains that the actual measurement of the body even in its gross appearance is not to be found. The same holds good for the internal organs. One should understand that this perhaps points to the fact that actual dissection was not in practice in medical education. That is why so many discrepancies arise while the texts illustrate the details of the 'material' body, but not of the 'bodily frame'. Basham comments, "the earliest medical text, that of Caraka, does not mention surgical operations at all. Evidently, from the point of view of the compiler, surgery was an aspect of medicine beneath the notice of the *vaidya*, to be performed by low-caste persons such as barbers... The taboo on contact with

human corpse was so strong, however, that even the emancipated *vaidya* dared not infringe it." (Basham, 1998: 27)

Some other aspects of Indian anatomical perception should be mentioned here. Regarding the origin and manifestations of *gulma* (phantom tumour) anatomical and physiological anomalies become once again explicit. *Gulma* is supposed to originate from vitiated state of *vāyu*, *pitta* and *kapha*. "Urinary bladder, umbilicus, heart and two sides of abdomen (*pārśva*) these are the five sites of manifestation of *gulma*." (Sharma and Dash, Vol. II: 255) Even if all the organs described above are true in their anatomical location, it becomes very difficult to explain how heart can be a site of phantom tumour. Another problem may from knowledge of origin of great vessels from heart. "There are ten vessels of great biological importance attached to the heart. The synonyms of heart *inter alia* are '*mahat*', '*artha*' and '*hṛdaya*'." (Sharma and Dash, Vol. I: 592) It is perhaps easily understandable that though the heart is assumed here to be associated with the origin of vessels of great importance, truly speaking, it is not represented in any anatomical sense (in modern terms). Rather it connotes psychic components of a person. Any organ described for the purpose of biological reality may be associated with non-biological meaning. In Kautilya's *Arthaśāstra*, references are found for dissection to study the examination of contents of stomach for traces of poison. (Mukhopadhyaya, 1974: 363) An anecdotal reference of cutting open the stomach of a person is found in a story of the Emperor Aśoka's young wife Tisyarakṣitā "It happened that Aśoka became very ill. Tisyarakṣitā commanded the doctors to send her a man suffering from the same disease; she had him killed, slit open his belly, and examined the stomach." (O'Flaherty, 1986: 35) Another anecdotal, yet interesting, example may be cited here. *Rāmāyaṇa* is the epical text which has shaped Indian populations subjectivity and societal orientation for generations. It is in some sense 'text-as-authority' per se. In the fifth *kāṇda* (Sundara Kāṇda) Sitā laments, "If Rāma the Ruler of the world does not come here, the evil Rāvaṇa, the king of Demons will cut off my limbs with his sharpened weapons, even as a surgeon would cut the limbs of a lifeless foetus." (*Rāmāyaṇa*, V. 28. 6) This particular passage points to some facts – first, Rāvaṇa has been compared with a surgeon, and, second, surgeons cut the limbs of a lifeless foetus. Does it indicate that any kind of surgical (anatomical) practices was in vogue in the society of *Rāmāyaṇa*? We do not have

any answer. But it keeps us pondering over the issue. To add, "Indian medical texts do not contain case histories of individual patients, or records of remarkable cures..." (Basham, 1998: 26) Contrarily, in the Western world individual case history taking and keeping a statistical account (in modern sense) of the jobs done were possibly a common practice. A comparative study with Galen's mode of practice may help us understand the issue in a better way. Galen even treated patients by correspondence, and sent therapeutic instructions and medicaments along with the diagnosis. Galen writes, "You should know that I have not only (personally) treated persons from this ailment but through correspondence I have cured some patients residing in other countries. Some sent me letters from Iberia (Spain and Portugal), from Celtic lands, from Asia, Thracia (the Balkans) and other countries, asking me whether I knew and could dispatch a trustworthy medicine against the beginning of suffusion." (Horstmanshoff, 1995: 86) As already discussed, absence or non-existence of anatomical atlases in Āyurvedic texts is an important characteristic feature. In fact, the visual representation of the medical body is a remarkably late phenomenon in Indian culture. However, some of the very earliest texts surviving from ancient India do deal with the body in detail as the subject of elaborate sacrificial rites. (Wujastyk, 2009) Knowing the body through dissection (and opening up inside out) was a spectacle for combing "real medicine" with "validity of ocular demonstration." (French, 1993: 86) Knowing is an art; science requires personal participation in knowledge. An anatomist's task in European tradition was to distinguish between *verbal* description and *visual* representation. Hopefully, two examples about 300 years apart would help to clarify the question concerned here.

Fig. 9

[The Clibanus-Zodiac Man. An accurate and detailed interpretation of the anatomy of man, the microcosm as described by Mondino (1258-1326) correlated with one aspect of his relation to the macrocosm. This illustration is 300 years before the Vesalius' historical text. Even in that period the organs seem to be organized not in one plane. They reveal the depth of the body. **Courtesy:** C. E. Kellett, "Two Anatomies," Medical History 8 (1964): 342–353.]

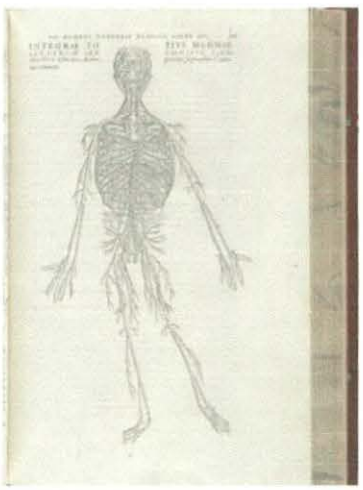

Fig. 10

[One of the spectacular anatomical illustrations from Vesalius - *De corporis humani fabrica libri septem.* (Basel: Johannes Oporinus, 1543), 395. Though guided by humoral theory this picture illustrates the three-dimensional vascular and bony structure of the body. **Courtesy:** *Historical Anatomies on the Web* (National Library of Medicine, US.]

Two other images, strictly in accordance with the classical Indian medical system, Āyurveda, are shown below. (Wujastyk, 2007) This will help to differentiate between two- and three-dimensional representation of the body. In this picture all the bodily organs lie in the same plane. The viewer cannot fathom the depth of the body.

Fig. 11

[**Indian anatomical painting:** (the picture above) c. 18th century, Western India. In the *Taṣ rīḥ-i Manṣūrī* style, but in an old-Gujarati manuscript. Wellcome MS Indic _74. **Courtesy:** Wellcome Library, UK.[8]]

III Medical Education in Ancient India

Modes of acquisition of knowledge in Āyurveda

In *Caraka Saṃhitā* it is stated in a clear manner that one cannot perceive a thing in its entirety by the knowledge only of a part of it and the physicians unsound in correct knowledge of disease is also confounded in the logic of therapeutics. "Such mistakes are committed by those who want to perceive a thing in its entirety by having only a partial knowledge of it." (Sharma and Dash, Vol. II: 198) Opposite to the good physicians, there were "the pseudo-physicians who instead of taking away the diseases, take the life itself." (Ibid, 589) How could these pseudo-physicians harmful to the society practice freely?

[8] For a comparative study of Āyurvedic body with European anatomical body see, Bhattacharya, 2009.

"These traitors in the garb of physicians move around the world due to the lack of vigilance on the part of the rulers." (Ibid, 589)

Three pertinent questions emerge out of this account – (a) the pseudo-physicians are very much deficient in the knowledge of medicine which must be taught in a regular and prescribed mode accepted by the norms of the society at that time, (b) the lack of vigilance on the part of the rulers did lead to such a situation, and (c) the rulers must be the license giving authority of an aspiring physician. Attendant to this problematic one must be inquisitive to know how this knowledge of medicine was being produced, how was the structure of that knowledge production and what was the nature of this knowledge of medicine. It is helpful to remember Basham's observation in this context, "The instruction of textbooks can only be taken as normative, and not as having been universally applied." (Basham, 1998: 25) The situation was so because of the possible fact that as described above there were so many untrained charlatans and quacks practicing medicine. "Nevertheless, the norms established by the texts are so strict that one cannot believe that they had no effect on the standards of medical practice." (Ibid, 25) Basham notes that the Vedic word *bhiṣaj* became increasingly known as *vaidya*. (Emmerick, 1993) "Since the word *Veda* is also related, the term has religious overtones which *bhisaj* lacks...The English "doctor" is semantically analogous, though here the emphasis is rather on the physicians giving instructions than on his acquiring it." (Basham, 1998: 23)

What were the attributes of a physician? "Excellence in medical knowledge, an extensive practical experience, dexterity and purity – these are the four qualities of physician," (*CS*, Sū, 9.6) Also, "Good memory, obedience, fearlessness and uninhibited expression – these are the four qualities of a patient." (Sū, 9.9) This particular issue is of considerable importance because of the fact that the patient is not meant to be an inert objectified body of medical knowledge for the physician. S/he must have 'fearlessness' and 'uninhibited expression.' These attributes tilt the patient-physician relationship towards patient-oriented medical practice, although it should be kept in mind that the specificity of religio-ethico-normative structure of ancient had taught people to regard physicians with great reverence and humility

The *SS* teaches us, "A physician, ignorant of the science and art of surgery and emollient measures Sneha-karma, etc. is but a killer of men out of cupidity, and who is allowed to carry on his nefarious trade only through the inadvertence of the king. A physician well versed in the principles of surgery, and experienced in the practice of medicine, is alone capable of curing distempers, just as only a two-wheeled cart can be of service in a field of battle." (Bhishagratna, Vol. I: 30) One must take note of the use of analogy with 'two-wheeled cart' and 'field of battle.' This may point to the fact that physicians' service was needed in the battlefield. Hence the question of king as the issuing authority of license for medical practice appeared in the texts. "The completion of the course was followed by an examination. This is implied by the observation of Charaka and Suśruta that it is the king's fault, if incompetent doctors practise the medical profession. Śukra also prohibits a person to practise as a doctor without possessing the king's license." (Altekar, 1944: 187)

For the proper study and practice of these different specialized branches of medicine, a good training in certain basic subjects formed the essential ingredients. These were: (a) anatomy, including dissection, and physiology (*śarira-vṛtti*); (b) aetiology (*hetu*); (c) pathology and pathogenesis (*vyādhi*); (d) therapeutics (*karma*); (e) objectives (*kārya*); (f) climatology (*kāla*); (g) pharmacology (*karana*); (h) medical and surgical procedure (*vidhi*). A methodology for science in general existed at that time and these principles were rigidly applied to medical science, in common with the philosophy of natural sciences. These were: (a) direct observation (*pratyakṣa*); (b) testing of the validity of observed facts (*anumāna*); (c) analysis of the facts observed (*yukti*); and (d) testimony of experts (*āptopadeśa*). Meulenbeld explains these categories thus – direct apprehension (*pratyakṣa*), inference (*anumāna*), comparison (*aupamya*) and trustworthy tradition (*etihya*). (Meulenbeld, 2008a) A wise man, desirous of adopting medical profession should, first, carefully select a suitable text on medicine. "There are several such texts available for physicians." (*CS*, Vi, 8.3)

Existence of a number of medical texts, probably competing, is revealed in this passage. Presumably, among these texts, *Carakasaṃhitā* is forwarded as the most dependable text. So the question of 'normative' text as pointed out by Basham becomes evident. Edelstein's study of The Hippocratic Oath might of help here to realize the

position in a more comprehensive way, "An ancient doctor who accepted the rules laid down by "Hippocrates" was by no means in agreement with the opinion of his fellow physicians; on the contrary, he adhered to a dogma which was much stricter than that embraced by many, if not by most of his colleagues." (Edelstein, 1987: 14-15) A prospective student of medicine had to take some of these Oath of Initiations (Menon and Haberman, 1970) – (1) Thou shalt lead the life of a celibate, grow thy hair and beard, speak only the truth, eat no meat, eat only pure articles of food, be free from envy and carry no arms. (2) If thou desirest success, wealth and fame as a physician and heaven after death, thou shalt pray for the welfare of all creatures beginning with the cows and Brahmanas. (3) No persons, who are hated by the king or who are haters of the king or who are hated by the public or who are haters of the public, shall receive treatment. Similarly, those who are extremely abnormal, wicked, and of miserable character and conduct, those who have not vindicated their honour, those who are on the point of death, and similarly women who are unattended by their husbands or guardians shall not receive treatment. (4) There is no limit at all to the Science of Life, Medicine. So thou shouldst apply thyself to it with diligence. This is how thou shouldst act. Also thou shouldst learn the skill of practice from another without carping. The entire world is the teacher to the intelligent and the foe to the unintelligent. Hence, knowing this well, thou shouldst listen and act according to the words of instruction of even an unfriendly person, when his words are worthy and of a kind as to bring to you fame, long life, strength and prosperity.

Menon and Haberman comment, "The spirit of the oath is essentially religious and it is apparently administered in a ritualistic manner." (Menon and Haberman, 1970: 296) Further, ""Not carrying arms' also has special significance in that this instruction implies that students of medicine did not necessarily have to come from the Brahman class; in practice, as Brahmans did not carry arms at any time, this statement would be redundant." (Ibid, 297) The authors make a relevant remark in their review, "This oath appears to be an indigenous product of Indian thought and culture. As pointed out in the commentary, most of the ideas found in the oath can be traced to similar concepts and sayings in the non-medical Indian literature of antiquity. The style of the oath, the rituals involved, the asceticism required of the student, the student-teacher relationship, the emphasis on the limitlessness of knowledge, the association of worldly prosperity, fame

and ethical practices: all these are in conformity with the mainstream of Ancient Indian thought and practices." (Ibid, 298) It is important to mention here that the medical profession was not like the Vedic scholarship an exclusive monopoly, in theory or practice, of any particular caste. Hence, Suśruta holds that a Kṣatriya or a Vaiśya physician also can play the role of the teacher for boys of his own caste. Altekar comments, "It is quite probable that Kshatriya and Shudra surgeons may have been, by tradition and environment, better adepts in the use of the knife than their Brahmana and Vaishya compeers." (Altekar, 1944: 290) Now the way a medical student conducted his mode of study and attaining his knowledge through participation in debates should be addressed. Debiprasad notes, "The *Carakasaṃhitā* also mentions theoretical conclusions characteristic of the other systems of medicine, i.e. differing from the one supposed to be codified in the text." (Chattopadhyay, 1977: 366) Therefore, he derives, "Apparently, in the ancient period, medical science is yet to be tongue-tied by authority, clash of views having much to contribute to its growth." (Ibid, 366) He further comments, "To resist the invasion of medical science by Vedic orthodoxy, the physicians require the general rule of excluding the possible confusion of contexts." (Ibid, 369) This last conclusion, among many other conclusions by him, seems to be over-emphasized. Another observation of much importance should be mentioned here, "Given the authoritativeness of the four 'classical' medical works, it is no wonder that these in course of time came to be supposed to contain all the necessary theoretical discussion on anatomy and physiology" as a result of which "it is thus not surprising that later works have occupied themselves more and more primarily with diseases, their symptoms and cures." (Das, 2003: 312)

Procedure of study

Ancient Indians regarded knowledge as unlimited and no period that one could spend for its acquisition was regarded as adequate for the purpose. The duration and contents of the course were therefore largely determined by the will, capacity and convenience of the student. Some students who wanted to get an all-round mastery used to read for as many as 25 or 30 years. Others who were home sick or were content with a superficial knowledge, used to return home in six or even three years. Altekar informs, "literacy was spread fairly widely among the higher classes." (Altekar, 1944: 102)

"He should get up early in the morning or in the last quarter of the night. He should then perform ablution and offer prayers to the gods, sages, cows, *brāhmans*, teachers, elderly and enlightened persons and preceptors and should then sit on an even and clean place. Thereafter, he should recite the *sūtras* orally with due concentration." (Sharma and Dash, Vol. II: 218) After proper understanding, to rectify his deficiencies and that of others he would go on repeating his recitation. "He should continue with his practice in the noon, in the after-noon and at night without any break." To increase one's knowledge "A physician should participate in a discussion with another physician. Professional discussion indeed promotes the power of application of knowledge and competition leading to enlightenment... During the course of discussion one comes to know of many new things which were not heard by him previously." (Ibid, 225-226) An assembly was of two types – (a) enlightened, and (b) dull. "In an assembly where members are neutral and are attentive, inclined to hear, learned, experienced, having the power of retention, speech and contradiction; one should carefully observe the good and bad qualities of the opponent as a participant in the discussion." (Ibid, 229) Regarding the nature of a *vāda* (debate) it usually is of two types - *jalpa* (disputation) and *vitaṇḍa* (wrangling). Then definite methods and steps to enter and engage into debates are discussed. To note, *vāda* is called by Caraka *sandhyāya sambhāṣā* too. (Matilal, 1997: 12) "Caraka makes a significant comment in explaining the concept of "reason" as part of the demonstration. The "reason" is what causes the apprehension or recognition of the object or the fact to be proven." (Ibid, 14) At the root of all these debates there lies the question of epistemology – comprising the characteristics of what we call 'Indian logic.' Matilal emphasizes "the claim to be that this was a different conception of logic, where the study of the connections between mental events and the justification of inferentially-acquired knowledge-episodes is not a fault." (Ibid, 14) This may be conveniently called "psychologized epistemology." (Mohanty, 2001)

It will be evident through the rest of the dissertation that this particular characteristic of Indian knowledge system was completely reconstituted by the introduction and transmission of Western knowledge in general and anatomy-based medical knowledge in particular. If it was good or bad is not the question of thesis. It only tries to trace the locus of these changes.

Suśruta Saṃhitā illuminates on the mode medical education through other details, "it is extremely difficult to classify drugs, taste, virtue (Guna), potency (Virya), transformatory or reactionary effect (Vipāka), fundamental bodily principles (Dhātu) bodily excrement (Mala), hollow viscera (Āshaya), vital parts (Marma) veins (Sira), nerves (Snāyu), joints (Sandhi), bones (Asthi) and the fecundating principles of semen and ovum, and to extricate any foreign matter lodged in an ulcer), or to ascertain the nature and position of ulcers or fractures, or the palliative, curable or incurable nature of a disease, etc." (Bishagratna, Vol. I: 33) Bishagratna comments, "these subjects perplex even the profoundest intellects though a thousand times discussed and pondered over, not to speak of men of comparatively smaller intellectual capacity." (Ibid, 34) Therefore, it becomes "imperatively obligatory on a pupil or a disciple to attentively hear the exposition of each shloka, or a half or a quarter part thereof, made by the preceptor (while studying the science of medicine)." (Ibid, 34) One must be careful of some of the terms used in the passages above. The entire learning process was based on *oral recitals* – no example of writing is mentioned anywhere. That is why, particularly in *SS*, at the end of most of the chapters there are 'mnemonic verses.' Education, as a result, "depended solely on learning by heart the texts and on instructions regarding the actions to be performed at different steps...whether they took up philosophy, grammar, classics, medicine or theology, had to think and understand, though even with them wholesale recitation was insisted on." (Bokil, 1925: 246-247) To mention, the number of students per teacher would vary from four to 20. So, it seems obvious enough, in such an education system 'Western' natural philosophical practices will remain absent.

There is mention of different kinds of operations such as Incising (Chhedya), Excising (Bhedya), Scraping (Lekhya) Puncturing (Vedhya), Searching or probing (Eshya), Extracting (Abārya), Secreting fluids (Visrāvya) and Suturing (Seevya). "A surgeon (Vaidya) called upon to perform any (of the eight preceding kinds) of operations, must first equip himself with such accessories as surgical appliances and instruments, alkali, fire, probe or director (Shalāka), horns, leeches, gourd (Alāvu), Jamvavoushtha (a kind of pencil shaped rod made of slate with its top-end cut into the shape of a Jamboline fruit), cotton, lint, thread, leaves, tow (Patta), honey, clarified butter, lard, milk, oil, Tarpanam (powdered wheat soaked in water), decoctions (Kashāya) , medicated plasters,

paste (Kalka), fan, cold water, hot water, and cauldrons, etc., and moreover he shall secure the services of devoted and strong-nerved attendants." (Bhishagratna, Vol. I: 37)

Private teachers usually imparted medical education. (Altekar, 1944: 185) According to Altekar, "Anatomical knowledge that was thus imparted was fairly high when compared with the contemporary standards elsewhere. Unfortunately in the course of time the dissection of human body went out of vogue, causing a setback to the progress of the medical science." (Ibid, 186) He also emphasizes that owing to the prevalence of stricter notions of ceremonial purity, the touch of the corpse became a taboo and dissection was consequently given up. This became fatal to progress in surgery, the practice of which gradually died down. The medical profession began to be held in low esteem as the doctor had to deal with filthy diseases and touch dying patients. (Ibid, 189) Altekar also observes, "Unfortunately for the progress of learning and scholarship Vedic literature was canonised some time about 600 B.C.... Theories began to be accepted or rejected according as they were in conformity with or opposed to the statements of the sacred books on the point." (Ibid, 251)

Now, the question of "Duration of the Course and Examination" may be discussed. The exact duration of the medical course is not known. Caraka and Suśruta do not enlighten us on the point. Caraka observes that no one can obtain a real all round efficiency in Āyurveda; this would also suggest a very long course. Altekar comments, "We may well presume that the student had to spend at least eight years, before he could get mastery in the subject." (Altekar, 1944: 187) He also notes, "None of our authorities however discloses the conditions under which the royal permission was granted under efficient administration. Very probably it must have been given to students who were certified to have finished their course either by superintendents of state hospitals, principals of colleges or famous private practitioners." (Ibid, 187) He finds that Mitākṣarā would show that the medical course was finished in four instead of eight years during the 12th century A. D. Here, one may argue that Altekar's previous analysis of solely private nature of education possibly does not comply with his observation of certificates being given by 'superintendents of state hospitals.' Training in the medical profession was efficient in India down to the 10th century A. D. Āyurvedic doctors were keeping themselves in touch with the discoveries and developments taking place

elsewhere, and experimenting upon new preparations as better medicines for ailments and diseases. The use of mercury, opium and metallic preparations was introduced into the pharmacopoeia in the medieval times. To stress, discontinuance of dissection and consequent decline in surgery however gave a setback to the system. "Owing to the prevalence of stricter notions of ceremonial purity, the touch of the corpse became a taboo and dissection was consequently given up. This became fatal to progress in surgery, the practice of which gradually died down. The medical profession began to be held in low esteem as the doctor had to deal with filthy diseases and touch dying patients." (Ibid, 189) Another point of mention is that Hindu education was thorough, but it was not sufficiently broad. Each branch was thinking of its own problems. Educationalists do not seem to have bestowed much thought on the relative utility of the study of the different branches like grammar, literature, logic, philosophy, mathematics and fine arts for the development of the intellect, the mind and the imagination. Specialization was started too early. As a result, "Hindu education had ceased to remove prejudices, explode superstitions and broaden the mind, so as to keep it capable of receiving instructions from all quarters by the beginning of the 9th century A. D." (Ibid, 289)

One more point may be raised here. As may be expected, there is no unanimity of views among ancient Indian thinkers also about the relative importance of nature and nurture. A young people, fortunate to have a series of successes, naturally feel that there is nothing impossible or difficult for man. Vedic Aryans belonged to this category and their age therefore did not much believe in heredity or natural endowments. This is emphatically expressed in one of the hymns of the Atharva Veda, where we are told that given proper education, everything can be accomplished. Even Indra owes his supremacy among the gods not to any penance or previous merit, but to his proper training during his student-hood. "A few centuries later we find a patriarch praying that some of his sons should become good priests, others brave warriors and the rest successful merchants (S.Br., X4.1.10) Obviously he did not much believe in heredity and held that a good deal depended upon proper training and education." (Altekar, 1944: 37) The duty to provide free education that was imposed upon teachers and institutions must also have naturally

resulted in making the admission test a stiff one. The test was partly moral and partly intellectual. Morally disqualified students were summarily rejected (Nirukta, II. 4).

Education was so long a private concern. The rulers looked into or visited educational institutions only for the sake of encouragement. Charity, either private or state, was the only source of income for them. No uniform standard of attainments was codified or insisted on by any central authority. The master or guru had his own way in teaching and managing except in so far as he respected the suggestions or criticisms of his patrons. (Bokil, 1925: 8) There was no question of fees to the teachers or preceptors for providing education or learning to students. It is necessary to note that what has been condemned by the sacred texts is a stipulation for the payment of fees as a condition precedent to admission; they have no objection to teachers accepting voluntary gifts from the guardians of students reading under them. Just as the teacher was exhorted to remember that teaching was his sacred duty, the guardian also was asked to note that no object in the universe, howsoever precious it may be, could be regarded as an adequate fee for even that humble teacher, who teaches a single letter of the alphabet. But in case of students being poor "Students whose guardians were really too poor to pay any honorarium were expected to help the teacher in his household work and pay him some honorarium at the end of the course by collecting subscriptions for the purpose." (Altekar, 1944: 80) The paternal relationship of the teacher towards the pupil was emphasized by the absence of any regular fee. The ideal is thus a domestic one (exceptions being there like universities like Taxila and Nalanda), and it is quite foreign to the Indian system that there should be a large institution or a large class of pupils taught together. All available evidence shows that the strength of a class under one teacher was usually about 15. Nalanda used to have about a thousand teachers for its student population of not more than nine thousand. In the 11th century in the Vedic college at Ennāyiram, each teacher had only about 20 students under his charge. At Benares during the 17th century, sometimes only four and usually about 12 to 15 students used to work under one teacher. In the 19th century the number of students under one teacher in Sanskrit schools at Nadia varied from 10 to 20. It therefore seems to be almost certain that the Jātaka statement about the teachers at Taxila having 500 students each is

an exaggeration. The normal strength of a class was never more than 20. (Altekar, 1944: 82-83)

It will be later seen that this particular characteristic of Indian education did have bearing on stagnation of medical education as a whole and anatomical knowledge and rise of hospitals in particular.

Unlike West, in India it is the teacher rather than the institution that is prominent, and the same affection and reverence which a Western student has for his *alma mater* is in India bestowed with a life-long devotion upon the teacher. Keay comments, "Even the introduction of Western education with its many teachers, and many classes, has not entirely broken down this ideal, in spite of the complications which it produces. To an Indian student a teacher who only appears at stated hours to teach or lecture, and is not accessible at all times to answer questions and give advice on all manner of subjects, is an anomaly." (Keay, 1918: 179) He asserts, "There is no country in the world where the responsibilities and opportunities of the teacher are greater than they are in India." (Ibid, 179)

This scenario began to change for ever with the arrival and consolidation of English education system. English education system did yield many beneficial results for India's advancement and rupture with scripture-bounded knowledge system. But we must have our critical look at this historical phenomenon with particular reference to medical education and anatomical knowledge. Keay found, "An ideal of Indian life which has a close bearing on education is that which has been happily termed *naissance oblige*." (Ibid, 180) Counteracting this spirit, "The tendency to extend a uniform system and so to reduce all education to the dead level of a code-bound type is already at work in India." (Ibid, 180) It should be noted that making of a 'uniform system' was gradually becoming ubiquitous. It reached out to almost every aspect of life and reconstituted the various branches of knowledge systems in an asymmetrically overdetermined space.

The transition from ancient and medieval India to colonial or modern India was not a straightforward journey. There was an intermission by pre-colonial or 'on the eve of colonialism' India. But, it should be remembered that the understanding of the relationship of *śāstra* ('theory') to *prayoga* ('practical activity') in Sanskritic culture is shown to be diametrically opposed to that usually found in the West. Theory is held

always and necessarily to precede and govern practice; there is no dialectical interaction between them. (Pollock, 1985)

At a later period in 1853, J. W. Kaye wrote about the significance of the establishment of the Medical College, Calcutta, "I think that the foundation of the Medical College of Calcutta is one of the greatest facts in the recent history of Indian Administration. Half a century ago, a project for the establishment of an institution, intended to convey to the natives of India instruction in European medical and surgical science, would have been scouted as the chimera of a madman." (Kaye, 1853: 617) From "the chimera of a madman", Western medical education became an irreversible reality.

In this concluding part of this chapter, one example can be cited from *Carakasaṃhitā*. Twenty-fifth chapter of Sūtrasthāna opens with a polemical situation where sages like Vāmaka, Pārikṣit, Vāryovida, Śaraloman, Hiraṇākṣa, Kāñkāyana etc. participated. In the final part of the debate disagreeing with "Bhardvāja, Kāṅkāyana said that if *Svabhāva* (nature) is taken to be the root cause of living beings it would mean that individual efforts (e.g. performance of rituals, cultivation, study etc.) are altogether useless." The debate was about to go on. But during the course of this controversial discussion of the sages Lord Punarvasu said –

tatharṣīnāṃ vivadatamuvacedaṃ punarvavasu / māivaṃ vocata tattvaṃ hi duṣprapaṃ pakṣasaṃśraya // (Sū. 25.26) [Please do not enter into such a controversy; it is difficult to arrive at the truth by taking sides with its partial aspects.]

Fatal termination of such a debate points to the fact that in the final analysis it was *āptopedeśa* (testimony of trustworthy persons), which became victorious. It was not the other way – neither *pratyakṣa* (direct apprehension) nor *anumāna* (inference) and *yukti* (proper application) – that was valid in the debate. (Roy, 2004)

In the following sections of this dissertation, there will be gradual explorations into this problematic.